SCIENTIFIC AMERICAN

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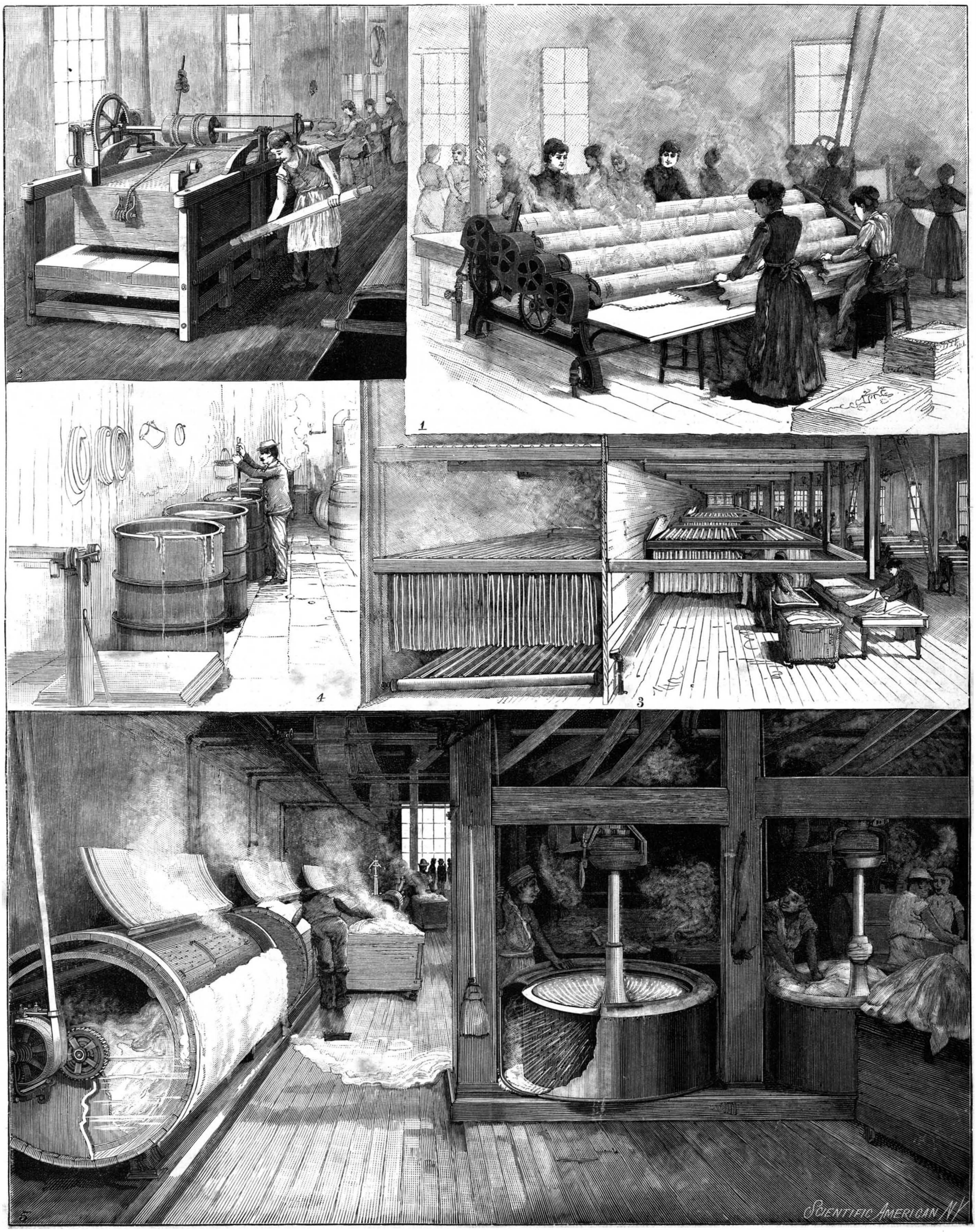

A MODEL STEAM LAUNDRY WITH CAPACITY OF HANDLING 100,000 PIECES A DAY.—[See page 23.]

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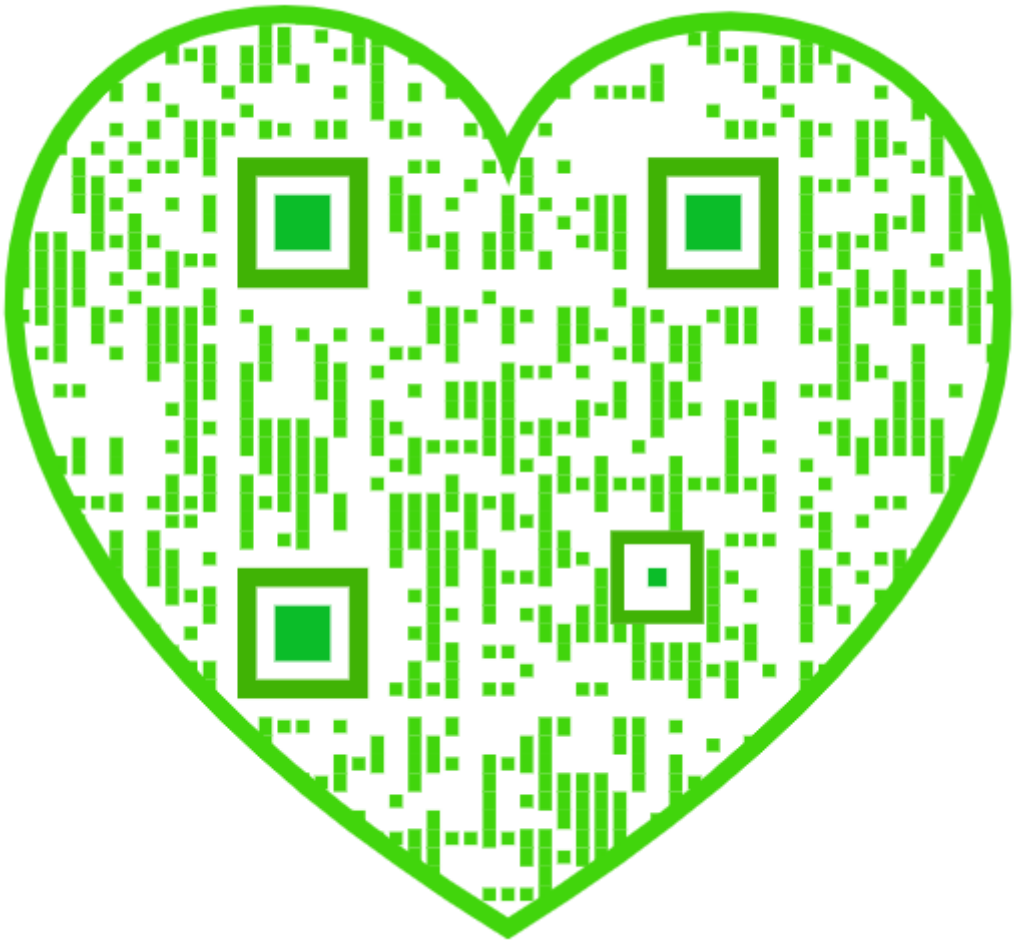

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THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES.

An extensive movement is now in progress in Brooklyn, looking toward the enlargement of the facilities of the Brooklyn Institute of Arts and Sciences, by the erection of a grand edifice to serve as a permanent abode of the institute and the establishment of an extensive museum, comprising all branches of the arts and sciences, laboratories for carrying on investigations in all branches, rooms for lectures, exhibitions, and public experimentation, and an enormous auditorium for large assemblies. Nothing similar to the Brooklyn Institute exists in this country, and we doubt if its like is to be found in the world, and the present movement toward placing it on a broad and permanent basis is one of which any city might well be proud.

The city of Brooklyn has ceded a tract of land near the beautiful Prospect Park, upon which the buildings are to be erected, and proposals from architects and builders are now asked for, and the matter is thrown open to competition.

The following gentlemen constitute the committee on competition: Gen. John B, Woodward, Mr. Eugene G. Blackford, Prof. Franklin W. Hooper. The preliminary sketches are to be handed in to the committee on or before the 28th day of February next, and a jury of experts are to pass upon the plans.

The buildings are to be on a grand scale, and in a style that will harmonize with the purpose for which they are to be erected. The department accommodations are to be divided up into two general divisions, those relating to art and those relating to science. Architecture, sculpture, and allied sciences will require about 90,000 square feet of floor space; the department of painting, etching, and engraving will require about 75,000 square feet; the architects and fine arts schools will require over 5,000 square feet; the department of archæology requires 12,000 square feet; anthropology, 15,000 square feet; zoology, including entomology, 30,000 square feet; botany, 11,000; to the department of geography is to be allotted 11,000 and to geology 20,000 square feet; mineralogy, 15,000; physics, 10,000; astronomy, 10,000, square feet; electricity, 15,000 square feet; the department of engineering calls for 20,000 square feet; mathematics, 4,000; the department of microscopy, 4,000, and photography, 9,000 square feet; chemistry, 11,000 square feet; to the department of pedagogy, 10,000, psychology, 5,000, and philology, 1,500 square feet; to the department of political science is to be allotted 15,000 square feet; law, 2,200; and to the department of music is allotted 13,000 square feet. Each department is to have space for collections, laboratory rooms for instruction, meeting room with library on walls, curator's room. The rooms of most of the departments are subdivided so as to provide accommodations for separate branches.

The department of astronomy is to have an observatory fitted with a large telescope, and ample provision is to be made in each department for practical work and original research. In addition to all this, a grand art gallery is to be provided in the upper portion of the building devoted to the arts.

Although this institution is local in name, its benefits and influence are not confined to the city of Brooklyn; it numbers its members by thousands and its growth is beyond precedent. Without doubt the day will soon come when scientific men and women all over the country will find it to their interest and advantage to belong to the Brooklyn Institute of Arts and Sciences.

Co-Operative Building Associations in New Jersey.

In a recent report of the Bureau of Statistics of Labor of the State of New Jersey the development and present condition of these societies in that commonwealth is well set forth. At the close of the year 1891 there were 272 incorporated building and loan associations in the State, having net assets of $25,600,000, owned by 78,700 shareholders. Of the latter, 19,255 were borrowers, 25·3 per cent of the outstanding shares being pledged, and the averages showing that as a rule persons in moderate circumstances, and for purposes not speculative, constitute the membership of these associations. The total installment dues paid in on the 518,717 shares outstanding in 1891 amounted to $20,484,127, and it has been shown that in these associations, as managed in the State of New Jersey, it has been seldom that the average annual rate of interest on a share investment has been less than six per cent, while as a rule the interest is much higher. Notwithstanding this fact, it is a striking characteristic of the building and loan association movement that the large amounts of money it has attracted do not appear to have had any effect on the normal increase of deposits in the savings banks. The business of these banks has steadily increased, although within a few years the net assets of the building and loan associations have at the same time grown to very nearly the total sum due to depositors by the savings banks. This is attributed partly to the fact that the associations reach some localities where savings banks are not at hand, and also attract a somewhat different constituency, investments in the shares being more in the nature of live capital than a reserve paying an abnormally low but sure rate of interest.

The true co-operative building and loan association, as recognized by the "legislative countenance and encouragement" of the New Jersey statute, is designed to confine itself to a comparatively small home district, enabling members whose position as borrowers in a general market would be otherwise most unfavorable to secure all the benefits which their position and personal character among their neighbors seem to entitle them to, in their efforts to build homes for themselves and their families. The corporation being local, and its membership recruited from the immediate neighborhood, its shareholders are able to manage its affairs themselves, are expected to be true co-operators, or at least personally acquainted with the managers and their standing in the community, having only themselves to blame if the latter turn out to be derelict. While the ordinary shareholder is far too little inquisitive about his association and its meetings, he is generally acquainted with the reputation of its controlling spirits, and is likely soon to hear of any suspicious circumstances which may relate to them, which would not be the case were the membership or the operations of the association spread over a large district. The association deals only with its own shareholders, and can only pay to one member what it receives from another; therefore, its design is to deal as moderately with its borrowers, the "home builders," as may be consistent with entire safety, guaranteeing also equality of benefits to all, in a business conducted with such simplicity that any shareholder may at all times be satisfied of the security of his investment.

Alcohol and Acetic Acid from Paper.

It is quite within the bounds of possibility, as every chemist knows, to convert, by a series of simple chemical operations, an old linen shirt into sugar and alcohol. By merely immersing linen in cold, strong sulphuric acid, the cellulin $C_6H_{10}O_5$, of which it is mainly composed, gradually dissolves, and, assimilating one molecule of water H_2O, resolves itself into glucose $C_6H_{12}O_6$. The glucose so formed may be recovered by neutralizing the excess of acid with chalk, and from the product so obtained alcohol may be prepared by the ordinary process of fermentation. According to recent researches, acetic acid, too, can also be produced from similar materials, as, for example, paper pulp, esparto grass, etc., all of which contain cellulin.

The process, although apparently so simple, is somewhat different in detail. By digesting any of the above substances, or, indeed, starch, sugar, or other carbohydrates with alkali, such as caustic soda, a salt of the alkali, acetate of soda, is formed. This can easily be recovered, and the product on distillation with sulphuric acid could be made to yield pure acetic acid, which it is well known is the acid of ordinary vinegar, in which it occurs to the extent of 3 to 4 per cent. Moreover, acetic acid $C_2H_4O_2$ being an oxidation product of alcohol C_2H_6O, it is possible by means of a reducing agent (a mixture evolving hydrogen) to convert it once more into alcohol. This conversion is only of theoretical interest, however, and of no practical value. Messrs. Cross and Bevan, who read a paper on this interesting action of alkali upon cellulin bodies at a meeting of the Society of Chemical Industry recently attached some importance to the process, as in all probability by its agency paper makers might be in a position in the future to recover from their waste materials a product (acetate of soda) of value in certain industrial processes. Apart, however, from the possible practical value of these results, they are calculated to throw a new light upon the nature and constitution of that important cluster of bodies known as the carbohydrates.—*Lancet.*

Traffic of the Elevated Railways, New York.

On October 12, the Columbian celebration day, the Manhattan system carried 1,075,537 people. The expression, a million people, does not convey any very definite idea to the mind, but it may assist us, says the *Railroad Gazette*, to understand what that figure means if we say that if the people who traveled on the elevated railroads on that day were arranged in single file as close as they could conveniently stand together, the line would reach from the Battery, in New York, up along the Hudson River to Albany, and out on the New York Central Railroad as far as Auburn; or they would reach from Troy to 40 miles beyond Buffalo. When we consider that probably there must have been at least 150,000 of these people who wanted to take the cars at the same time when the parade was breaking up, that this crowd would fill 300 trains of cars to their utmost capacity, and that that number of trains distributed over the entire tracks of the elevated railroads, both up and down, would leave only 300 feet intervals between trains, it is not surprising that there was considerable delay in getting on and off the trains and that travel was very slow; but it is remarkable that, so far as known, not a single accident occurred to any of the 3,000,000 of passengers that were carried in the three days, October 10, 11, and 12.

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Breathing Wells.

That the earth breathes by the movement of the atmosphere into and out of its depths may no longer be doubted as a myth derived from occasional observations of this phenomenon. When it is considered that the whole superstratum of the earth that is not saturated with water is a porous mass of loam, sand, and gravel, at any depth from the surface, to hundreds of feet below it, and in many localities lying on or beneath extended beds of clay or stratified rock inclosing cavernous spaces; and that it is well known that sand and gravel, that is not saturated with water, has the spaces between its particles filled with air or gases that are elastic and subject to contraction and expansion by changes in pressure; it may rationally be assumed that the interspatial air or gases in the vast sand and gravel beds and cavernous spaces beneath the earth's surface will be affected in its density by the variations in the density of the atmosphere above; that under this condition the ground breathes the life-giving atmosphere that purifies the noxious subterranean elements by oxidizing their constituents, or in other words aerating the underground waters by contact with the percolating moisture from the surface.

There can be no doubt, in the face of accumulated observations, that the barometric changes of pressure in the atmosphere do not stop at its surface, but extend downward into the depths of the porous sand beds and into the cavernous recesses of the earth, and that wherever such porous beds are covered with a clay or rock stratum, cutting off the direct pressure variation over a large district, any penetration of such strata makes a connecting vent with the outer atmosphere, and the variation of pressure in the outer atmosphere immediately extends its influence to the subterranean air spaces beneath the sealing clay or rock strata.

The relation of blowing caves to changes in atmospheric pressure is a well attested fact, except a few instances where there are two openings, by which the wind also produces internal circulation and ventilation.

In close caves with a small single outlet the barometric changes in the atmosphere are the principal source of their ventilation, by the blowing or breathing of air through their mouth or entrance simultaneously with the movement of atmospheric waves of pressure.

This phenomenon has been observed in detail both in open wells and bored or artesian wells in the Western States, where the later geological strata extend in nearly unbroken sheets of clay, limestone and sandstone over large tracts of country. In many parts the water-bearing strata are deeply seated under beds of sand and gravel covered with thin layers of clay or limestone near the surface.

In Illinois and Iowa some of the breathing wells become intermittent gas wells by the action of variable atmospheric pressure, showing a gas-saturated understratum which under varying atmospheric pressure breathes gas intermittently with the rise and fall of the barometer.

This class of wells has been tested by closing and inserting a whistle, which would blow according to the barometric change, inward when the barometer was high and outward with a low barometer.

There is a breathing open well near Stanwood, Oregon, 90 feet deep to the water surface; the excavation passing successively through layers of clay, sand and stratified rock, with a thin seam of coal at 80 feet down, and at the bottom a mass of broken stone or volcanic debris, which forms the water stratum. This well gave much trouble in digging from an intermittent flow of gas, and, in consequence, the work was delayed several months.

Finally, when finished, it was discovered that gas flowed at intervals only, always succeeded by an inhalation of air for about the same length of time, the intervals being from one to five or six days. Shortly after the well was finished, the gas ceased to flow, but the respiration of the well continued with increased force, enough to run a small windmill placed in the mouth of the well, reversing its motion with the change in direction of respiration.

There being several breathing wells in Kansas, one was sealed and tested with a siphon water gauge.

The record shows a similarity between the curves of pressure in the barometer and the curves of well pressure, only that the minimum pressure in the well was equivalent to and at the same time of the maximum pressure of the barometer, and the reverse.

Thus when the barometer was lowest, the pressure outward from the well was greatest, and the reverse.

Under this condition, with a low barometer, the well would blow or exhale, and, with a high barometer, would draw in or inhale air. Thus the well becomes a natural barometer.

The actual extremes of positive and negative pressure in the well, the positive being the blowing pressure and the negative being the inhaling pressure, was but little over one-half the extreme of barometric pressure; the total difference in water pressure being 2·30 inches, while the total range of the barometer was three-tenths of an inch, or 4 inches water pressure.

The fact that the porous soil of the neighborhood, or possibly neighboring wells, relieved the well under observation of its pressure by slow ventilation was made evident in the course of the observations, for when the barometer suddenly rose and remained high for a day or two, the pressure inward to the well would gradually decrease to zero; and upon a sudden fall in the barometer and continuing for a day or two at low stage, the outward pressure in the well would again gradually decrease to zero.

Under large barometer variations a whistle, attached in place of the water pressure gauge, could be heard, as stated, all over the town, giving, by its intensity, the magnitude of the barometric range. G. D. H.

Fall of a Meteoric Stone at Bath, South Dakota.

BY A. E. FOOTE.

On the 29th day of August, 1892, about four o'clock in the afternoon, while Mr. Lawrence Freeman and his son were stacking upon his farm two miles south of Bath, they were alarmed by a series of heavy explosions. On looking up they saw a meteoric stone flying through the air, followed by a cloud of smoke. Its course was easily traced to the point where it fell, within about twenty rods from where they were standing. The stone penetrated the hardened prairie to a depth of about sixteen inches and when reached it was found to be so warm that gloves had to be used in handling it. Three small pieces of an ounce or two each had apparently been blown off by the explosions, but the stone still weighed 46¾ lb. One of these small pieces was found by some men not far distant and was broken up and distributed among them. The explosions were plainly heard by a large number of people at Bath, two miles away, and at Aberdeen, nine miles away, it sounded like distant cannonading. The exterior of the stone presents the usual smooth black crust. The interior is quite close-grained, resembling in texture the stones from Mocs. The iron is abundantly disseminated through the mass, and although the grains are small, they are easily distinguished and separated on pulverizing.

Preliminary tests made by Mr. Amos P. Brown, of the mineralogical department of the University of Pennsylvania, prove the presence of nickel and cobalt in considerable quantity. An affidavit signed by Charles Freeman (before H. T. Root, notary public) stating the facts of the fall is in the hands of the writer, to whom the stone was sent.—*Amer. Jour.*

A Chance for Inventors.

The government of India is offering a number of prizes for the best designs or models of a cart suitable for military requirements, to wit, a mule cart for the transport use of the British army in India. The prizes offered are five in number, and are respectively $3,750, $2,500, $1,875, $1,250, $625, or $10,000 in all. *Industries* says: The award will be intrusted to a jury consisting of three military and three technical experts. The question of cost being of the highest importance, the designs should give the estimated price in pounds sterling or rupees of a single cart delivered free on board in London or at Bombay, Calcutta, or Allahabad. As a guarantee of good faith on the part of the competitor as regards estimated cost, he will, if recommended for a premium, receive, in the first instance, only one-half of such premium immediately on its award. He will, however, only receive the same proportion of the other half as represents the proportion by which he may have under-estimated the actual cost of the cart. It is left to the jury to ascertain by tender in the open market, or by such other means as it considers suitable, the cost of the cart to government, and to make its award accordingly. The object desired to be attained by this competition is the production of a design, accompanied in all cases by a working model, for a military transport cart adapted to conditions which make the use of interchangeable metal parts for all important portions of the cart absolutely indispensable. The designs and models should reach the secretary to the government of India, Military Department, Calcutta, not later than June 30, 1893.

Invention—Discovery.

"For by invention," says Fielding in "Tom Jones," "I believe, is generally understood a creative faculty, . . . whereas by invention is really meant no more, and indeed the word signifies, than *discovery*, or finding out; or, to explain it at large, a quick and sagacious penetration into the true essence of all the objects of our contemplation," and of this little criticism can be made. Nevertheless, with as little risk of criticism the United States courts, in interpreting the patent statutes, accept the "generally understood" meaning of Fielding's day, it being settled that the "invention" of the statutes signifies a creative faculty, and the same high authority also construes "discovery" in the statutes to be synonymous with invention as thus interpreted, and correctly so; though we should despair of convincing the partisans of the great author that the court rulings were devoid of the humorous.

Possibly, indeed, the learned judges had even in mind Fielding's lucid interpretation, and conformed their rulings on the words to the principle of action and reaction.

American vs. Foreign Files.

A large proportion of the cutting points on a file never do actual service of any kind. On a new file the work is done by the very few highest points, then as these are broken off and worn down others do some service. These last, however, do not have a chance to do much service, being withheld by the worn and dull points from effective contact with the metal. Files again are cut with such blunt tools that their cutting points have no satisfactory backing of material. This backing always is a concave fillet, giving the point great sharpness but no strength. These facts indicate the need of an improved means of making files, or perhaps the finding out of the method by which the Swiss cut their famous Grobet kinds. One of these Swiss files will outcut and outwear four American files. An English Stubbs file will outwear more that two American files; but they are not so evenly cut as the Swiss. It is not solely in the cut that these foreign files are better than ours. They put in honest steel. One maker of files told me what make of steel he used. It is believed that this steel can be bought for less than four cents a pound by the ton. The Swiss files again, and the Stubbs files also, in a degree, are better finished tools than anything of the kind made in America. A Grobet file is generally about mathematically correct. The hardening in both these foreign files is uniform and good. Year after year, decade after decade, these files come to us. They were the best in the world at the time I entered the door of the first shop that knew my efforts, and they are the best to-day. Now, what is the matter with American files? Our steel is good, we have the mechanical ability, and we have the market, for we use more Swiss files than all the rest of the world, and I am of opinion that we consume more Stubbs files than the whole of the British empire. Americans do not need to be ashamed of many kinds of native metal work, but our files are below comparison.—*Albert D. Pentz, in the Engineering and Mining Journal.*

Reply.—The above article shows that the writer thereof is practically unfamiliar with the present mode of manufacturing files, and therefore his statements should be taken with a large degree of allowance. He claims that the famous Grobet or Swiss file will outcut and outwear four American files, and the English Stubbs file will outwear more than two American files. The writer is a large manufacturer of American files, and answers by saying that market conditions, of which he has a very general knowledge, and positive information derived directly from large consumers of files all over this country, make him certain that the above statements are incorrect.

A well cut American file will do just as much work and even more than a Grobet of the same cut. The English Stubbs files have always had a good reputation, and while Mr. Pentz places their quality below the Grobet file, the real facts are the Stubbs files are considered by nearly all file manufacturers, and also by nine consumers out of ten, to be of better wearing quality than the Grobet make.

Mr. Pentz's assertion in regard to honest steel as used by file makers again shows a lack of knowledge on his part as to the conditions governing the manufacture of files. Quite recently a prominent engineer and large user of files in France expressed his preference for American files manufactured by the writer's company, on the ground that actual tests had proved to his satisfaction that the quality of steel used in our American files was better than the best English make.

But I will admit that Stubbs uses a better quality of steel in his files than that generally used by English or American manufacturers. The steel at present used here in the manufacture of files is a comparatively low-priced steel, and yet fully as expensive as the steel used by any foreign manufacturer, except Stubbs.

As regards finish of the Swiss files, they are handsome in appearance, but I think the Nicholson File Company, of Rhode Island, in the manufacture of their X F's, exceed in style and finish any maker of small Swiss files.

I also take exception to the statement made by Mr. Pentz, as regards the uniform temper in a file of foreign make being better than the files of the best American makers. Now and then, in this country, you will find a few machinists who still think they must have a Grobet file to finish with, a Stubbs taper saw file to improve the cutting qualities of a very hard saw, and an English file for general machine shop work. To such users I can only say that not only is the English market in Canada and other provinces of Great Britain being absorbed by the better make of American files to-day, but it is also a fact that in England, the home of some of the best files made in the world for general machinist's uses, files of certain American manufacture have not only entered that market, but gone there to stay, and have become formidable competitors of the best brands of English files, Stubbs not excepted.

J. D. FOOT.

New York, December, 1892.

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AN IMPROVED SCHOOL CHAIR AND DESK.

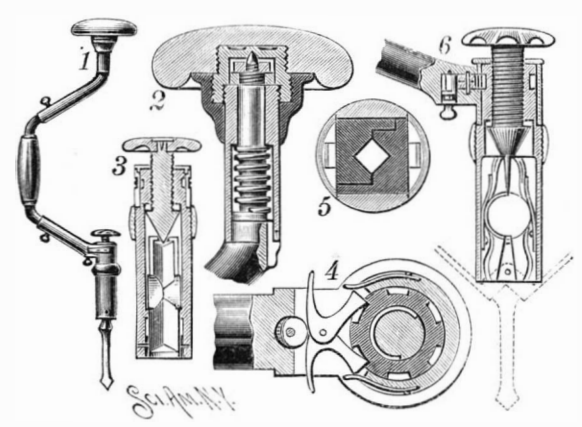
The providing of desks and seats suitable for children of various sizes at school is often quite a troublesome matter, and, with the ordinary styles of school furniture, frequent changes are necessary. An improvement designed to obviate this difficulty is represented in the accompanying illustration. It consists of a desk or seat supporting standard, capable of vertical adjustment, whereby the desk or seat may be readily raised or lowered as desired, to suit the needs of different pupils. The upright portion of the standard

THE CHANDLER ADJUSTABLE CHAIR AND DESK.

is provided with a series of grooves or recesses, and slides vertically within a base portion, on which is arranged a horizontally sliding double or U-shaped spring adapted to engage the grooves or recesses in the vertically-sliding upright. The desired adjustment may be quickly and easily effected, when the spring is secured in place by a clamping bolt, the construction preventing any rattling or loose motion from inaccuracy in the fitting of any of the parts. The desk is firmly supported on each side, and the chair, when adjusted to the height required, is practically as substantial as if it were a solid piece of iron, as the clamping bolt cannot be loosened if tampered with by the pupil, being fixed in adjusted position by means of a wrench. This improved chair and desk have already been tested in practical use in the schools at Somerville and Brockton, Mass., and in Port Chester, N. Y., where they are said to have given great satisfaction. Further information relative to the improvement may be obtained of the Chandler Adjustable Chair and Desk Co., No. 7 Temple Place (rooms 43 and 44), Boston, Mass.

AN IMPROVED BIT BRACE.

The brace shown in the illustration has a readily attachable and detachable knob, with an easy bearing and excluding dust and dirt, an extensible and ad-



KNUDSEN'S BIT BRACE.

justable crank, a convenient and easy handle, an improved ratchet connection between the brace crank and the bit shank, with a new and efficient means of fastening bits of various sizes to the brace, and other novel features. The improvement has been patented by Mr. Andrew Knudsen, of Tucson, Arizona Territory. Fig. 1 shows the device in perspective, Fig. 2 being a sectional view of the knob, Fig. 3 a section of the jaw-holding and adjusting mechanism, Figs. 4 and 5 showing the ratchet mechanism, and Fig. 6 illustrating the bit-holding and adjusting mechanism. The bearing knob is socketed on its inner side and screwed to the reduced end of a screw cup or nipple, which has a socket to receive the bearing cone of the brace stem, extending through a tube. The two crank arms each comprise two members, one adapted to slide within the other, the parts being held together in desired position by thumb screws, the arrangement being such that by pushing the members well in the brace may be turned in small space, where but little power is required, while by pulling out the members greater leverage is obtained. The crank handle has an inner two-part tube, the parts of the handle being hinged together and having overlapping portions, spring-pressed pins within the handle projecting through the overlapping parts, the pins being pressed inward when the handle is to be removed. The lower end of one of the members of the lower crank arm terminates in a cylinder which turns on the ratchet head formed integral with the bit-holding shank, the rotation of which in either direction is provided for by a simple pawl and ratchet arrangement. A screw extending longitudinally through the ratchet head has at its upper end a turning knob by means of which the outer ends of the jaws may be forced together or allowed to spread apart, enabling the jaws to be clasped firmly to a bit and be very quickly adjusted. Each end of the jaws fits several sizes of bits, and by reversing the jaws they may be made to fit many sizes, several pairs of jaws being preferably provided for each brace.

The invention is designed to improve the entire construction of a bit brace, that it may be easily adjusted, efficiently operated and nicely and strongly finished.

Prevention of Lead Poisoning.

Lead poisoning among glass polishers due to the tin putty employed may, according to M. Gueroult, be entirely abolished by a new plan which has for the last eighteen months been adopted at the Baccarat Glass Works. The old tin putty that was used was a stannate of lead which was manufactured in special furnaces by oxidizing three parts of lead with one part of tin. In the new material two parts of metastannic acid are added for each part of putty, the lead being reduced to about a third of the old proportion. Under the former system numbers of workmen suffered from lead paralysis, and many had to leave the works entirely. Since the introduction of the metastannic acid putty, however, not a single case of lead poisoning has occurred.

AN IMPROVED CONVEYER OR ELEVATOR.

The construction shown in the illustration has buckets arranged for self-loading and self-dumping without breaking the material, which may be safely carried to any desired distance. The improvement has been patented by Mr. George H. Tench, of Pottsville, Pa. Chains moved by sprocket wheels carry buckets, each made in two parts, a body and an end gate, each part being rigidly secured to different links of the chain, so that when the latter passes over the wheels the end gate of each bucket opens and closes, as shown. As arranged for an elevator, one end of each bucket is open, and the lower ratchet wheel on which the chain is carried is inclosed in a casing connected with a chute through which the material to be elevated is fed, the buckets fitting snugly in this casing. As the filled bucket reaches the upper ratchet wheel, as shown in one of the views, the body of the bucket is tipped by the link to which it is attached, disengaging the body from the gate and permitting the contents of the bucket to pass into the delivery chute. The body and gate of the bucket remain separated during the passage of the chain around the wheel, the gate closing on the body when the parts again reach a vertical position on the chain. With the device arranged as a conveyer, as shown in one of the views, the horizontally traveling chains bring the buckets at the receiving end of the casing in contact with material passing down a chute, the end gate closing upon each filled bucket at the time it reaches its lowermost position. The bucket remains thus closed during its horizontal travel, until it reaches the next ratchet wheel, when the body swings into an annular position away from the gate, and the material is dumped into the delivery chute, the body and gate remaining disconnected until they again reach the horizontal position, the buckets then being upside down.

Gelatine Slides for Lantern Projection.

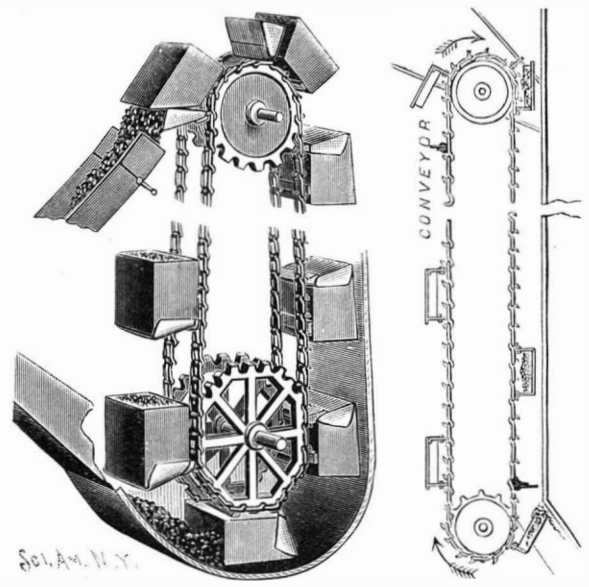
Prof. W. J. Waggener states that he has been very successful in making diagrams and pictures for projection by the magic and the solar lantern by printing the same, with the ordinary printing press and engraved blocks, on sheets of transparent gelatine. By this means excellent lantern slides from diagrams and engravings of nearly if not quite all kinds can be made and multiplied as rapidly and almost as cheaply as paper prints.

The extreme of cheapness in the production of pictures can be reached by assembling many engraved blocks together and printing all at once on large sheets of gelatine or celluloid, which can be afterward cut into pieces of suitable size.—*Amer. Jour.*

[The printing of engravings for lantern slides on sheet gelatine has been practiced for more than twenty years.—ED. SCI. AM.]

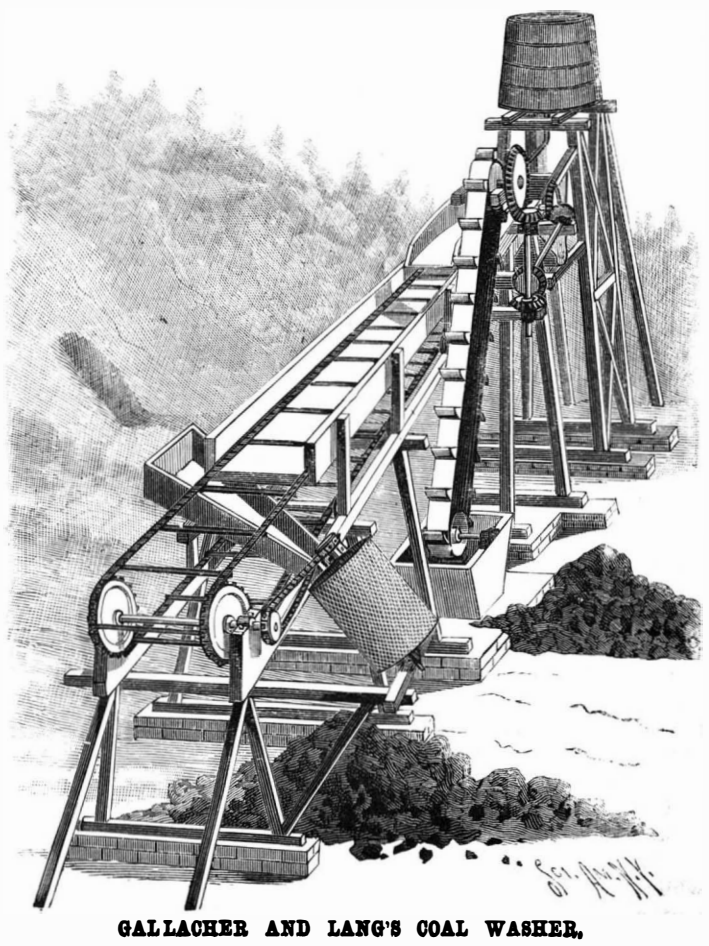
A MACHINE TO WASH AND SCREEN COAL.

The machine shown in the illustration is designed to thoroughly wash and screen coal with the use of a small amount of water, effectively separating the dirt and refuse from the coal. The improvement has been patented by Messrs. James Gallacher and George Lang, of Chickasaw, Ala. The open-ended trough at the top of the inclined framework has slots or grooves in its sides and bottom, in which run chains on rollers, the chains being carried by sprocket wheels and provided with transverse scrapers moving upward on the trough bottom, carrying the dirt and finer particles settling to the bottom of the trough as the coal is car-



TENCH'S CONVEYER OR ELEVATOR.

ried downward over the scrapers by the water. Connected by bevel gears with the shaft operating the upper sprocket wheel is an elevator, at the lower end of which is a hopper to receive the coal as it comes from the mine, and deliver it into a chute leading into the trough near its upper end. A valved water pipe leading from a tank above lets water into the chute with the coal, and a branch pipe discharges water into the extreme upper end of the trough above the chute, thus washing back any coal which may be carried above this point. At the lower end of the trough is an inclined rotary screen, driven from the lower sprocket wheel shaft, by which the coal may be screened, and the pea coal separated from the fine slack. The dirt and refuse carried to the upper end of the trough by the scrapers is delivered into a conveyer arranged at right angles and leading off to a suitable dumping place. The whole construction is comparatively inexpensive, and the machine has a large capacity and may be operated at small cost.



GALLACHER AND LANG'S COAL WASHER.

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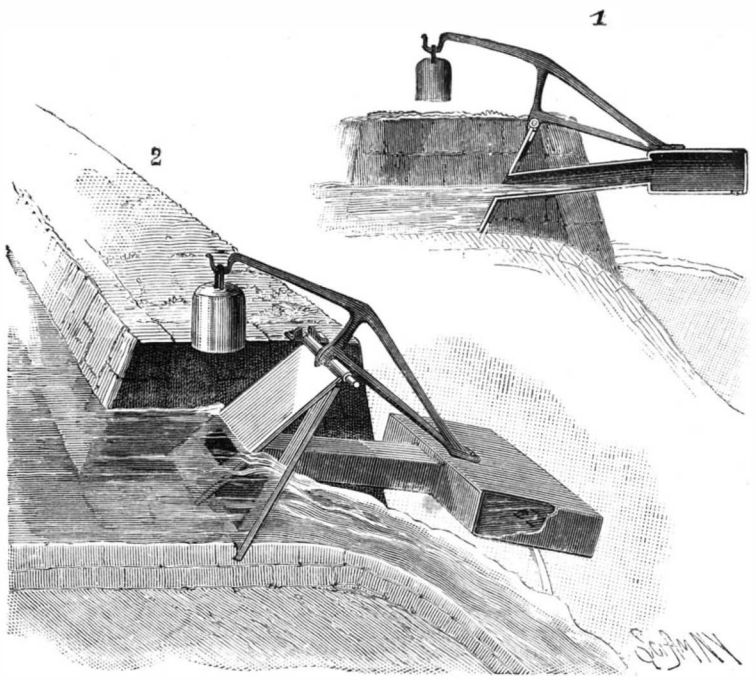
AN IMPROVED AUTOMATIC WATER GATE.

A waste gate which works automatically to control the overflow of wasteways or sluiceways of canals is shown in the accompanying illustration. The gate is designed to normally stay closed, opening automatically only when the water has risen to a certain predetermined height, when, by permitting the surplus water to escape through a suitable raceway, any damage likely to be caused by the water overflowing the banks is prevented. The improvement has been patented by Mr. George W. Norton, of Mohawk, Arizona Territory. Fig. 1 is a vertical section of the improvement, as applied in practice, the gate being closed, while Fig. 2 is a view in perspective, showing the gate opened by the rise of the water. In the wasteway is fitted an open gate frame, the top of the frame at the sides having bearings in which is journaled a cross-shaft to which is rigidly attached a swinging gate, and a counterpoise whose balance is changed by the rise and fall of the water. The counterpoise is secured at one end to a tank connected by a pipe to an opening in the gate, and on its other end is suspended a weight, whereby the gate will be held closed when the water is at a normal height, the tank at such times being empty. But with the rise of the water the tank fills, as shown in Fig. 2, and it then overbalances the weight and swings downward, thus opening the gate. The gate will remain open until the water falls below the opening leading to the tank, a small aperture in the bottom of the latter soon discharging it of its weight of water after the inflow has ceased, when the weight on the other end of the counterbalance pulls it down and closes the gate.



NORTON'S AUTOMATIC WATER GATE.

DR. WERNER VON SIEMENS.

It is with the deepest regret that the announcement has been received of the death of Dr. Werner von Siemens, which took place on December 6, 1892. A brief sketch of his life was given in the SCIENTIFIC AMERICAN of December 17, and we now add the following details:

It was in 1839, at Magdeburg, at the age of 23, that he began his scientific investigations. His first experience was unfortunate, for an explosion, caused by a preparation of phosphorus and chlorate of potash, burst the drum of his right ear. As he had met with a similar accident to his other ear some time before, he was for a time stone deaf. His studies were fated to be again interrupted, for in the autumn of 1840 he was sentenced to five years' imprisonment for acting as second in a duel.

"Stone walls do not a prison make" was more than exemplified in his case, for being allowed to continue his experiments, he successfully plated a silver spoon with gold. The silver spoon was connected to one pole of a Daniell cell, a *louis d'or* to the other. It was a great disappointment to him when, after a month's imprisonment, he was pardoned, and begged that he might be allowed to use his cell to complete some experiments.

A patent was granted him in Prussia, in 1841, for electro-gilding and silvering. In 1842 he and his brother, William Siemens, took out a patent for a differential regulator.

In 1844 he was appointed to the artillery workshops in Berlin, where he turned his attention earnestly to telegraphy, and in 1845 patented his dial and printing telegraph instruments, which were based on the self-breaking principle of the Neef's hammer.

In 1848, at Kiel, he laid down the first electric submarine mines. They served to protect the town of Kiel, and saved it from being bombarded by the Danish fleet.

The Prussian government, in the autumn of 1848, deputed him to lay the first great underground telegraph line from Berlin to Frankfort-on-the-Main, and in the following year another from Berlin to Cologne, Aix-la-Chapelle, and Verviers. Werner von Siemens now left the army and government service and devoted himself henceforth to scientific pursuits and the management of a telegraph factory, which he and Mr. Halske established in 1847. The firm has since then acquired a world-wide reputation, and is indissolubly connected with the growth and progress of telegraphy. During the laying of the first underground lines Werner von Siemens had observed the then remarkable phenomenon of electrostatic induction, which exercised so retarding an influence in the working of those lines. He described the phenomena in a paper communicated to the Paris Academy of Sciences in the year 1850. The underground system of telegraphs had, however, to give place to the overground, on account of the technical difficulties mentioned. But the experience gained from these failures resulted in overcoming the difficulties, with the result that the lines were relaid underground about 1878.

From the period of 1845 an almost uninterrupted series of scientific and technical discoveries and inventions emanated from him and from the factory under his direction.

In 1845 he devised a machine for the measurement of small intervals of time, and the speed of electricity by means of electric sparks, and its application, in 1875, for measuring the speed of the electric current in overland lines.

The firm of Siemens & Halske, in 1851, erected the first automatic fire telegraphs in Berlin. The difficulty of communicating through long underground lines led him to the invention of automatic translation, which was afterward improved upon by Steinheil; and in 1852 he furnished the Warsaw-Petersburg line with automatic fast-speed writers. The messages were punched in a paper band by means of the well-known Siemens lever punching apparatus, and then automatically transmitted in a clockwork instrument.

In 1854 the discovery (contemporaneous with that of Frischen) of simultaneous transmission in opposite directions and multiplex transmission by means of electro-magnetic apparatus was made, and two years later the Siemens magneto-electric dial instrument, giving alternate currents, was constructed. From this apparatus originated the well known Siemens armature, and from the receiver was developed the Siemens polarized relay, with which the working of submarine and other lines could be effected with alternate currents; and in the same year, during the laying of the Cagliari Bona cable, the construction and first application of dynamometers, also the development of the theory of submerging cables in deep water, took place.

DR. ERNST WERNER VON SIEMENS.

In researches on the subject of electrostatic induction and the retardation of the current in insulated wires representing Leyden jars, Werner von Siemens developed mathematically Faraday's theory of molecular induction, and thereby paved the way in great measure for its general acceptance. The construction of the ozone apparatus, telegraph instruments with alternate currents, and translation and automatic discharge for cable lines, were devised in 1857. The Sardinia, Malta, and Corfu cable was in the same year worked with such instruments.

In 1859 came the construction of an electrical log; the discovery of the heating of the dielectric by induction; the introduction of a reproducible standard resistance measurer (Siemens unit); the construction of resistance bobbins and the testing of insulated wires by systematic methods were also effected by him; also researches on the influence of heat on the electrical resistance of metals, and the establishing of methods and formulæ for testing resistances, and for the determination of faults by means of resistance measurements instead of with current measurements as formerly used.

In 1866 the establishing of the theoretical principle of dynamo-electric machines, which led to the construction of dynamo-electric mine exploders and light apparatus. In 1874, a treatise on the theory of the laying and testing of submarine cables; and in May, 1875, researches on the influence of light on crystalline selenium; and in 1876 and 1877 on the change of conducting power of selenium by heat and light.

He had continued reading papers and addresses down to the present time, and had contributed of late years much to the theory of electro-magnetism.

Werner von Siemens' scientific knowledge and inventive genius, combined with the great mechanical ability of his partner, Mr. Halske, soon developed the telegraph works of Siemens & Halske, in Berlin, into a large establishment, from which Mr. Halske retired in 1867.

In 1865 Werner von Siemens introduced pneumatic dispatch tubes into Berlin; the system adopted there served as a model for that laid down in London by Siemens Bros., in 1871. The railway signaling and block system of Siemens & Halske, which has been adopted by many Continental railways, was the first to ensure a forced dependence between the electric and semaphore signals and the position of the points.

In 1879 Werner von Siemens constructed an electric railway in Berlin. The electric energy was transmitted to the moving carriage, or train of carriages, through the two rails upon which it moved, these being sufficiently insulated from each other by being placed upon well creosoted cross sleepers. This railway, which was much used during the Berlin Exhibition of 1879, was the direct progenitor of the Lichterfelde line, one rail serving as the conductor from the dynamo, the other as the return. This railway has continued with success from 1881 down to to-day.

The alcoholometer ranks as one of the most ingenious of Werner von Siemens' inventions. This apparatus registers with perfect accuracy the actual quantity of absolute alcohol contained in the spirit which is passed through it.

About 1,000 workmen were employed at the Berlin telegraph and cable works as early as 1879. Siemens & Halske were among the first to construct telegraph lines in Germany and other countries. In 1854 a branch firm was established at St. Petersburg, under the direction of Carl Siemens, who became a partner. A complete network of government telegraph lines for Russia was constructed and erected by this firm. In the year 1857 a branch of the firm was established in London, the well known Siemens Bros. of to-day. The development of Siemens & Halske's business since the introduction of electric light and traction is one of the most remarkable facts in industrial enterprise. They have carried out much of the electric light and traction work on the Continent, and the latest development is the opening of a large branch house in America, where it is expected they will compete with advantage with the American manufacturers.

For his scientific labors, Werner von Siemens had in the year 1860 the degree of Doctor (*honoris causa*) of the Berlin University conferred upon him, and in the year 1873 he was elected member of the Berlin Royal Academy of Sciences. The Patent of Nobility was bestowed upon him in 1888 by Frederick III. He was for a long time member of the Prussian Parliament and the vice-president of the Society for the Advancement of Industry in Berlin; he was also member of the Asiatic Society in Calcutta, and honorary secretary for Germany of the London Society of Telegraph Engineers (now the Institution of Electrical Engineers), and was honorary member of the Institution of Civil Engineers, London, etc.

Not the least important of his many labors was the

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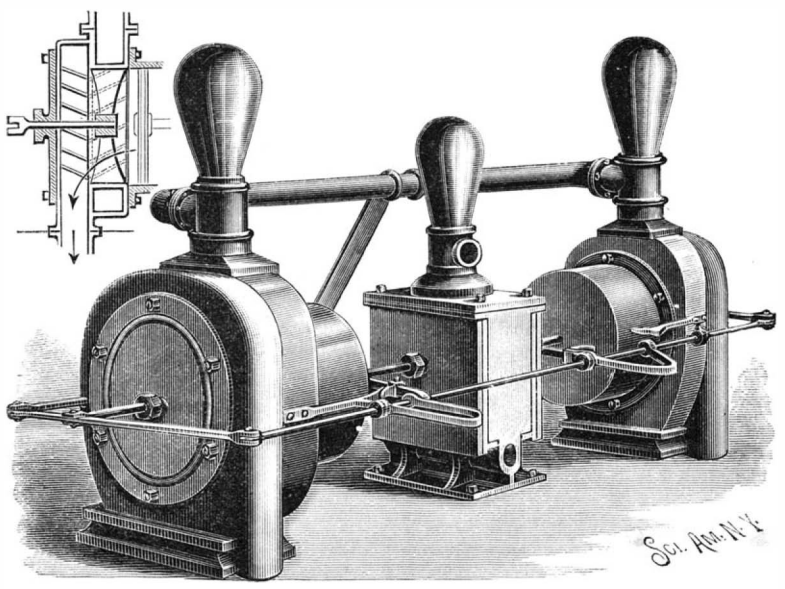
obtaining for Germany a practical patent law, after agitating this subject for a number of years, in connection with the Society for Patent Protection, which he founded, and of which he was appointed permanent president.

For the foregoing particulars we are indebted to the *Electrical Review*, London, and for our portrait to the *Street Railway Review*.

The funeral took place at Berlin, December 10. Chancellor Von Caprivi, Dr. Von Boetticher, Secretary of the Home Office; Herr Von Berlepsch, Prussian Minister of Commerce; Dr. Hermann von Schelling, Prussian Minister of Justice; the municipal authorities, and a large number of scientific men and artists were present. The funeral was conducted with much pomp. The route to the cemetery was lined with thousands of people. Four thousand workmen from the Siemens factory followed the hearse. Among the floral offerings was a wreath from Thomas A. Edison, inscribed "To my friend."

AN IMPROVED MOTOR.

The motor shown in the engraving is more especially designed for use on artesian wells, etc., to obtain, with a low pressure of water as a driving medium, a large amount of power for actuating other machinery. The improvement has been patented by Mr. B. S. Partridge, of Jacksonville, Fla. The machinery to be actuated may be of any desired construction, the improvement being represented as applied to a double-acting pump, the piston in the middle pump being on a piston or power rod carrying pistons in cylinders near its ends, these cylinders being open at their inner ends and connected at their outer ends with the valve chests of inlet chambers through which the motor agent enters. In these chests slide cylindrical valves, whose rims open and close the inlet and the outlet ports alternately, the valves having each a central hub and radial spokes, as shown in the sectional view, to form a discharge opening for the cylinders at the time the valves are seated over the inlet ports of the inlet chambers. The valves are at all times entirely surrounded or filled with the motive agent, and thus are constantly and perfectly balanced. Outwardly extending valve stems are pivotally connected with transverse pivoted arms, whose free ends are pivotally connected with each other by a rod extending at one side from one outer end to the other of the motor. This rod slides in bearings formed on arms secured to the power rod, the bearings engaging collars on the ends of V-shaped springs, which have at their other ends collars abutting against collars secured to the rod, while the latter collars abut against spring arms secured to the valve chests. In operation, as the power rod moves in either direction, one of the springs is first compressed and then released, to force in one direction or the other the rod connected with the valve stems at the ends, thus alternately opening and closing the outlet and inlet ports in each chamber. A practical test of this improvement has been made before the Board of Public Works and the fire department of Jacksonville, Fla., in which water was taken at 20 pounds pressure through a 6 inch pipe, and, using a 2½ inch hose and ¾ inch nozzle, a stream was thrown 107 measured feet, the pressure varying from 40 to 60 pounds, and when the valve was closed the pressure rose to over 100 pounds. As this was effected with an experimentally made motor, it is claimed that much better results can be obtained with a motor specially manufactured after approved patterns in accordance with this invention.



PARTRIDGE'S WATER MOTOR.

Ocean Mails Under the American Flag.

The new foreign mail service so far contracted for under the recent act of Congress is as follows:

Beginning of Contract.	Termini of Routes.	Number of Trips.	Period of Contract.
Apr. 26, 1893..	Galveston to La Guayra	3 times a month.....	5 years.
Mar. 1, 1892..	New York to La Guayra	3 times a month.....	10 years.
Feb. 1, 1892..	New York to Colon....	3 times a month first 2 years; once a week 8 years	10 years.
Feb. 1, 1892..	San Francisco to Panama	3 times a month first 3 years; once a week 7 years.....	10 years.
Feb. 1, 1892..	San Francisco to Hong-Kong.....	Once every 28 days; once in 2 weeks.....	10 years.
Oct. 12, 1895..	New York to Southampton.....	Once a week	10 years.
Oct. 12, 1895..	New York to Antwerp.	Once a week.....	10 years.
Dec. 10, 1892.	New York to Buenos Ayres.....	Once a week with calls; 28 days without.....	5 years.
Dec. 1, 1892..	New York to Rio.....	Once in 24 days.....	5 years.
Nov. 1, 1892 .	New York to Tuxpan..	Once a week.....	5 years.
Nov. 1, 1892..	New York to Havana...	Once a week.....	5 years.

The new service applies to eleven lines, comprising, when completed, forty-two ships of 165,802 tonnage, and the contractors will be required to spend $14,000,000 to provide ships necessary to make the service contracted for frequent enough and quick enough to comply with the terms agreed upon.—*Report of the Postmaster-General.*

The Manufacture of Small Arms.

At a recent meeting of the Institution of Civil Engineers a communication on "The Manufacture of Small Arms" was read by Mr. John Rigby, M.A., superintendent, Enfield factory.

The author traced the history of the interchangeable system of manufacturing small arms, from the date of the first factory in England, set up in 1852 at Pimlico by Colonel Colt, who imported the machinery from America. He then proceeded to describe the various processes of manufacture of the components of the Lee-Metford Mark I. magazine rifle, of 0·303 in. bore, the weapon adopted for the British army, prefacing the account with a general description of the Enfield factory.

The most important part of a rifle was the barrel, which had always engaged the special attention of gunmakers. Up to the time of the Crimean war it was, for the bulk of British troops, a comparatively rude tube of iron, lap-welded under rolls and tapering externally, with a cylindrical bore of about ¾ in. diameter. The barrel of the present day was a steel tube of accurate workmanship, only $\frac{8}{10}$ in. bore, almost perfectly true and straight, rifled to $\frac{1}{2000}$ in., and so closely inspected that the existence of the most minute gray or seam in the bore, requiring a highly practiced eye to detect it, was sufficient to condemn it. The material used was produced either by the Siemens-Martin or the crucible process of manufacture, and was supplied to Enfield as a solid round bar 1⅜ in. diameter and 15½ in. long. After severe testing, this bar was passed through a rolling mill to draw it to its full length; it was then taken to the forge, the swell at the breech end was stamped to the required shape by a steam hammer, and afterward straightened cold. The next step was to submit the bar, without annealing, to the turning and drilling machines. The latter were horizontal, the drills operating from each end. In the process of drilling the barrel revolved at nearly 1,000 revolutions a minute against half-round bits held flat down, a capillary tube of brass supplying soap and oil emulsion, at a pressure of 80 lb. to the square inch, to wash out the swarth and cool the cutting edge. The drills advancing from each end continued boring until a small disk about $\frac{1}{100}$ in. diameter broke out, and the two holes met. The tendency of the drills to follow the line of axis of a revolving bar was one of those curious occurrences in practical mechanics which might be accounted for after observation, but which no one would predict. Occasionally, through some defect in the steel, a drill wandered from the axial line; in this case the barrel was taken from the machine and reset sufficiently to bring the hole true again. To test its truth, a ray of light was made to illuminate the flat bottom of the hole while the barrel slowly revolved. It was very rarely that a barrel was rendered waste from bad drilling. Rough boring followed with a three-edged bit, the blade being about 4 in. long. The rough external turning was effected in self-acting lathes, which gave the required curved taper. Three or four cutters acted simultaneously, each producing a long cutting that attested the quality of the metal of the barrel. The operation of barrel setting followed. Previous to rough turning, the barrels were fairly straight internally, but the removal of the metal caused slight inequalities which were tested by the eye of the barrel setter, and corrected by transverse blows. This constituted skilled labor of a peculiar character, and was performed by young men of good sight, who were specially trained for that purpose. After middle life the eye generally lost some of the quality necessary for this work, and it was rare to find a man excel in it after that period. Many mechanical devices had been contrived to supersede the simple ray of light laid, as if it were a straight edge, along the surface of the bore; but the eye still remained the arbiter of straightness and could be relied on for very accurate results. The construction of the barrel was completed by the important operation of rifling. In British small arm factories the system was followed of planing out each groove separately with a hooked cutter, and had been brought almost to perfection. In Continental and American factories the grooves were plowed out by cutters with several cutting or knife edges set at an angle and following one another in the manner of a single-cut file or float. Similar machines have been tried at Enfield, but did not give as smooth a cut as the slower moving single-tooth machines. A few passes of a lead lap fed with fine emery removed any burr that might remain, and completed the polish; a cylindrical lap, spinning rapidly, was then passed through, and gave the final finish to the barrels. The limits of gauging were from 0·303 in. to 0·305 in. Next in importance to the barrel was the mechanism of the breech, for which the material preferred was crucible cast steel of a mild character, but capable of being hardened in those parts exposed to the pressure of the bolt. The body was forged in two operations under the steam hammer; it was then drilled and subjected to a long series of operations, in the course of which the end was recessed to receive the screwed end of the barrel, and the corresponding thread in the recess was milled out in a specially contrived machine, which insured that the thread should always start in the same place relative to the gauged part of the body, a point of great importance. The bolt, also of crucible cast steel, was forged under the steam hammer. A special machine, invented at Enfield, was used to finish the bolt after shaping. After machining, the bolts, packed in wood charcoal in iron cases, were heated and hardened by immersion in oil. The temper of the handle was then reduced in a lead bath. The rest of the bolt was tempered straw color. The bolt head was similarly hardened and tempered.

The other components of a complete rifle were mostly shaped by mills built up to the proposed profile, or by copy milling machines. The process of drifting was used with good results at Enfield. All such slots or perforations as had parallel sides, and were not cylindrical, were so finished. The common practice in drifting was to push the drift, but at Enfield much better work was accomplished by pulling. It was found that used in this way drifts were very valuable for interchangeable work. The sides were cut with successive teeth, each slightly larger than the preceding one, and the whole length of the drift was drawn through. Emery wheels were also largely used at Enfield, as a substitute for finish milling and filing. The wheels ran under hoods connected with a pneumatic exhaust that carried away the heated particles of steel and grit. It was popularly supposed that a machine once adjusted to turn out a component of a certain size and shape was capable of reproducing such in large numbers, all absolutely identical. This was so far from being the case that no die, no drill, and no milling cutter actually made two consecutive articles of the same size. The wear of the cutters or dies proceeded slowly but surely, and it was only possible to produce in large numbers components of dimensions varying between a superior and an inferior limit. In small arm manufacture a variation of about one two-thousandth of an inch was about the amount tolerated, but it varied according to the size of the piece. A difference of diameter of one two-thousandth of an inch in the sight axis hole, and in the size of the pin or axis, would cause a serious misfit, whereas a similar difference in the measurement of the magazine, or of the recess in which it lay, would be quite immaterial. The operations of gauging, proving the barrel, and sighting, were successively described, as also the manufacture of the stock, which was of the wood known as Italian walnut, though largely grown in other countries. Among the smaller components, the screws were mentioned as being rapidly produced by the automatic screw-making machines of Pratt & Whitney.

The component store received the various finished parts, which numbered 1,591, or, including accessories, 1,863, and issued them to the foreman of the assembling shop. Theoretically, the assemblers should have nothing to do but to fit and screw them together, but in practice small adjustments were found necessary. The amount of correction was generally exceedingly small, and was done wherever possible with the aid of emery wheels. The completed arms were submitted to inspection and then issued in cases of twenty each to the Weedon government store or elsewhere.

The paper concluded with an account of the manufacture of swords and sword bayonets, which had recently been resuscitated in England.

ILLUMINATED walking sticks are among the latest applications of electricity. A small incandescent lamp is concealed in the head of a cane and can be ignited by a spring.

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THE MODERN STEAM LAUNDRY.

The Empire Steam Laundry, of this city, presents an example of how modern laundry work is done. The requirements of the great steamboat and steamship companies, and of the hotels and restaurants, far surpass anything known of in the past, and to execute their laundry work appliances of the most perfect description are required.

In our illustration we represent several phases of the work as executed in the largest laundry of this city, an establishment which must be among the great laundries of the world.

When the articles are received in the building an account of their number is sent with them, or sometimes they are counted there. The washing machines, which are shown in one of the cuts, are cylindrical boxes containing each of them a drum of nearly their own diameter, and perforated with holes and with an opening through which the goods are introduced. The articles are put into this interior drum by hand, the door is closed and bolted and water is turned in and the machinery is started. The machinery rotates the drum alternately in one direction and in the other, an automatic belt shifter being provided for reversing the motion. A solution of soap, one or two bucketfuls, is introduced, and the operation of alternate rotation in one direction and in the other is kept up until the goods are washed. The wash water is then drawn off and replaced by clear water, and the drum being still kept in motion a rinsing is effected. Ultimately, the water in which they are rinsed is heated so as to remove the last particles of soap.

The next operation is the drying or wringing of the goods. This is effected in centrifugal driers similar to those used in the sugar industry. These are seen at work in the drawing to the right of the washing machines. The wringer being stationary, the operator packs it as full of the linen as possible, stowing it compactly down in the drum. The shaft which carries rotating drum holding the goods is journaled at the top or at the bottom only; in the machine represented in the cut is suspended from the bearing; in other instances it is carried by a lower bearing only. The rapid rotation of the drum by its gyroscopic action imparts the requisite steadiness. When full of wet goods, the belt is thrown on the moving pulley and the drum begins to rotate slowly, acquiring speed gradually. The action of the centrifugal force on the goods is quite interesting. When the wringer starts it is packed full to the top. As the drum acquires velocity the goods are forced out against its periphery, so that eventually the linen is all squeezed into a hollow cylinder and the center of the drum is quite empty. The water that is thrown out through the perforations of the side of the drum is caught by the casing and runs away. The articles are now ready for the mangling or ironing.

As an object of interest, we reproduce in the cuts one of the old-fashioned mangles, which is still in use and gives good satisfaction for a certain class of articles. A large box weighted with iron and stone and other refuse material is caused to travel back and forth over the table. At the ends of its course, wheels carried by brackets on one or the other end of it, as the case may be, striking on an inclined plane, raise first one end and then the other. The goods to be mangled are wrapped around a wooden roller together with a light blanket or cloth. As the box tips up at the end of its course. one of these rollers is placed under it, then as the box returns, its weight comes upon the roller, and rolling thereon, completes its course, subjecting the material to very heavy pressure at the ordinary temperature. The roller is removed at the release and the article is taken from it and another one put in its place.

Several of these machines are used and are found to give, for a certain class of goods, a better finish than the hot process machines.

Several kinds of hot process mangles of the more modern construction are employed in these works. The one we illustrate is known as the Hagan mangler. In it four rolls geared together rotate over a four-sectioned steam table. This steam table is grooved where the rollers come upon it, so as to almost fit their peripheries. The rollers are covered with felt, one edge of this being pasted to them by starch paste, the rest wrapped around them in such a direction that the natural rotation of the rollers tends to draw it always tighter. In operation the goods are straightened out, as shown in the cut, at the side of the machine furthest from the reader, and are inserted beneath the first roller. This catches them between its periphery and the smooth and highly heated steam table, and draws them forward, smoothing them out and delivering them to the next roller; this in turn delivers them to the next, and so on to the fourth, they finally coming out at the nearer end of the machine dry and mangled or ironed. The rollers are spaced some distance apart, and as the damp goods go through them clouds of steam escape from the three interstices, so that one passage through this machine virtually dries them and leaves them ready for folding.

In other mangles an apron is used to facilitate the passage of the goods. One point in the arrangement of the successive rollers in this type of machine is to wrap them with a little greater thickness of felt or cloth as the delivery end is nearer, to make the rollers successively increase in diameter from the first to the last. This increase is very slight, but it is enough to produce an increased rate of feed, so as to bring a slight tension to bear upon the goods as they go through. The mangles are heated by steam, turned into the hollow rolls or tables. The hot process mangles effect the drying. Sometimes the articles are passed through them a number of times in order to complete it.

When large articles have to be mangled, ordinary steam room drying is resorted to, and one of our cuts shows the drying chambers. These are simply large rooms with very long steam coils arranged near the floor and provided with racks that roll in and out on elevated tracks and rollers. On these racks the goods are hung, the racks being drawn out into the room; the racks are then pushed back into the drying chamber, the doors are closed and the goods left there until dry.

The capacity of the laundry is put at 100,000 pieces per day. The washing machines will accommodate 300 sheets at a time, or 1,500 towels. To illustrate their capacity for quick work, the following may be cited:

The river steamboats deliver their goods in the morning and take them away in the afternoon, it being quite possible to receive a consignment at 12 o'clock and turn it out finished at 5 o'clock in the afternoon. Sometimes a single ship, such as the Etruria or Umbria, will bring in from 20,000 to 25,000 pieces in a single consignment. It will be seen from this on how large a scale the work is done.

One interesting feature of the establishment is that they manufacture their own soap. Five hundred pounds of tallow, of the very best quality, are melted down, and to it are added 10 pounds of caustic potash and 70 pounds of caustic soda. These are heated to between 100° and 125° F. The saponification takes place without the addition of water, and after a thorough reaction, the soap is allowed to cool and is ready for use. It is not delivered solid to the laundrymen, but 75 pounds of it are dissolved in a tank containing 600 to 700 gallons of water, and from this one or two buckets are taken at a time to be thrown into the washing machines.

Photographing by Binoxide of Nitrogen and Bisulphide of Carbon.

We know that bisulphide of carbon burns in the air with a blue flame, and that mixed with the gas binoxide of nitrogen it also burns, but giving rise to a magnificent violet light, extremely rich in chemical rays. It suffices to have seen this flame to perceive all the advantages to be obtained from it. The treatises on photography make no mention of this source of light, and nevertheless, in certain cases, it might be preferable to many others. Is it because the bisulphide of carbon has a disagreeable odor, or because it is tedious to prepare the binoxide? Perhaps so. In any case, after experimenting, we advise amateurs to make some trials. We affirm that they will be astonished at the results obtained. The photographic power of this flame is incontestably superior to that of magnesium. The light produced is neither dazzling nor blinding, and is very far reaching. The background of the apartments show admirably on the plate, and the subjects no not make the horrible grimaces too often remarked when using magnesium. Here is the mode of proceeding:

After having focused and placed the sensitive plate, the objective is uncovered; then a lighted candle is brought near to a bottle containing one or two quarts (according to the size of the rooms), filled with binoxide of nitrogen, and in which have been previously poured a few cubic centimeters of bisulphide of carbon. Care must be taken to thoroughly agitate the liquid so as to completely saturate the gas. I advise operators to make this mixture of gas and bisulphide in the open air, and to bring the bottle well stoppered into the room before approaching the lighted candle. As the combustion evolves sulphurous acid, the bottle should be placed near a window opened at the time of lighting the mixture, or at the entrance of a door.

As to the binoxide of nitrogen, it is prepared in the same manner as hydrogen: in a quart vessel with two tubulars, in which are placed 30 grammes of copper (in pieces) and 100 grammes of a mixture of commercial nitric acid, and at least one-half of its volume of water; if the disengagement is too active, add water; if it becomes slower, add a few cubic centimeters of undiluted acid. The preparation is made in the open air, and in advance, as the gas will keep indefinitely. It should not be inhaled, as it is changed into red acid fumes as soon as it comes in contact with the air. I have constructed a special continuing appliance, allowing no bubble of binoxide to escape, and which may remain permanently in the laboratory. The continuing apparatus of Deville, which we might feel tempted to use here, is objectionable on account of its allowing the fumes of the nitric acid to escape into the atmosphere. I will revert to this subject in another article, and to the working of a new non-explosive lamp, by means of which beautiful portraits may be made at night, which is so rarely successful with magnesium.—*V. Lirondelle, in Bulletin de la Societe Photographiques du Nord de la France; Photography.*

Professor Eben Norton Horsford.

Professor Eben Norton Horsford, formerly Harvard instructor, died recently in Cambridge, Mass. Professor Horsford was born in Moscow, Livingston County, N.Y., July 27, 1818, his father being Jerediah Horsford, a colonel in the war of 1812 and member of Congress. Prof. Horsford was graduated from the Rensselaer Polytechnic Institute in 1838, went to Germany and spent two years in the study of analytical chemistry and experimental research in the Liebig Laboratory at Giessen. On his return was elected to the Rumford professorship of science applied to the arts in Harvard, spent the next sixteen years in the first laboratory organized and equipped for instruction in analytical chemistry in this country. He then resigned to go into the business of manufacturing chemicals in Providence, R. I., and afterward became president of the Rumford Chemical Works, in Boston. Professor Horsford discovered acid phosphate. He was an able writer on scientific subjects, and more than thirty years ago he published an account of the result of many successful experiments for stilling waves by spreading oil upon the surface of the sea, and he lately gave to the world a lexicon of five Indian languages. During the closing years of his life Professor Horsford took a great interest in Wellesley College. He provided for the endowment of the library and for continuous supplies to the departments of physics, chemistry, botany and biology.

Chromium.*

BY EM. PLACET.

Metallic chromium has hitherto been nothing but a laboratory curiosity, and in most instances the name has been given to a more or less pure carburet of chromium. I have succeeded in obtaining the metal by a new electrolytic process, which I will succinctly describe.

An aqueous solution of chrome-alum is prepared, to which is added an alkaline sulphate and a little sulphuric or other acid. This solution is then electrolyzed. At the negative pole a beautifully brilliant deposit is formed on the surface of the electrode, and this deposit consists of pure chromium. The metal is very hard, and is of a beautiful blue-white color. It resists atmospheric action perfectly, and is only attacked by concentrated sulphuric acid, nitric acid, and a concentrated solution of potash. When the electrolytic deposit takes place under certain conditions, it is even possible to obtain arrangements of chromium crystals, which recall the branches of fir trees. This metal, which can now be prepared on a thoroughly commercial scale, furnishes numerous alloys, which are being investigated.

I may add that this new process has led me to investigate "chromage," if such a word be permissible, or the electrolytic deposit of chromium upon the surfaces of different metals and alloys. My experiments have succeeded perfectly. With baths similar to the one described above I have obtained an adherent deposit of chromium of a thickness variable at will and resembling oxidized silver, upon brass, bronze, copper and iron.

I am glad to be able to place before the Academie a specimen of metallic chromium weighing more than a kilogramme; also samples of chromium alloys and brass ornaments electroplated with chromium.

Fast Torpedo Boats.

The famous torpedo boat builder at Elbing, Schichau, has just attained an unprecedented speed even for this class of vessel, torpedo boats built by him for the Russian and Italian governments having reached 27½ knots on an hour's run at sea. The new British boats are to be 200 tons displacement, while the Russian boats are 130 tons, so that the former may do better by reason of greater power and greater size. The length of Schichau's boat is 152 feet 6 inches, the beam 17 feet 5 inches. She may carry 40 tons of coal in her bunkers. On trial, however, she had only 20 tons on board. The small guns carried weighed 2½ tons; the torpedo armament, 6 tons; the crew, provisions, stores, and firearms, 4½ tons; drinking water, 2½ tons; engine and boatswain's stores and reserve parts, 4½ tons —so that all the movable parts come to 20 tons, making, with coal, 40 tons. The vessel and the machinery are, therefore, very light. The shell plates are barely a quarter of an inch thick. There are two locomotive boilers, protected by the coal bunkers, supplying steam at 195 pounds pressure to high speed engines. The guaranteed speed was to be 26½ knots in the open sea, while on trial the vessel actually made 27½, or to be precise, 27·4 knots, as a mean of one hour's steaming at sea. Schichau promises even higher results with torpedo boats he is now completing.—*The Steamship.*

* From the *Comptes Rendus*, vol. cxv., No. 22 (November 28).

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BREAKAGE AND REPAIR AT SEA OF THE MAIN SHAFT OF THE STEAMSHIP UMBRIA.

The Umbria is a splendid first-class mail steamship, single screw, belonging to the Cunard line, plying between New York and Liverpool. Her dimensions are: 501½ feet length, 57 feet 2 inches beam, depth 38 feet 2 inches, 8,128 tonnage, 10,500 horse power. She is one of the fastest of the large ocean steamers, her average of all passages being 18·15 knots or about 20 miles per hour.

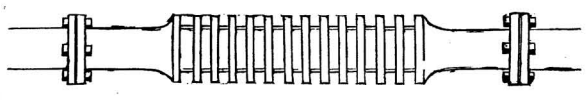

Fig. 1.—THRUST COLLARS OF THE SHAFT.

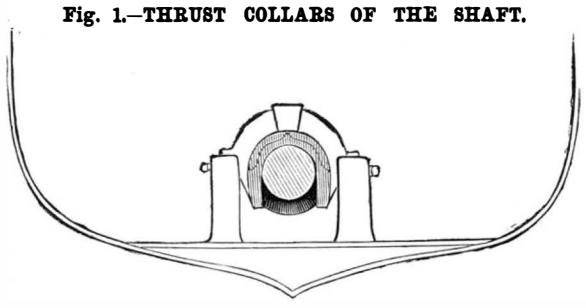

Fig. 3.—SHAFT AND THRUST BLOCK.

On the 23d of December last, when off the Newfoundland coast, while flying along under full speed, on her voyage to New York, the chief engineer, Tomlinson, discovered cracks in the main shaft. The engines were immediately stopped and measures taken to repair the break.

The highly successful nature of the repairs and the size of the ship which, by their aid, was brought into port make it a subject of unusual interest.

Upon the shaft of a screw steamer there is a section which is provided with a number of collars, larger in diameter than the shaft, that receive the longitudinal thrust of the propeller shaft. Fig. 1 shows the collared portion of the Umbria's shaft.

This portion of the shaft rotates between two longitudinal abutments of iron, called the thrust block. Into grooves in this thrust block Π-shaped yokes or collars of iron are set from above (see Fig. 2), one of these yoke or collar blocks coming behind each of the collars of the shaft. The shaft collars exert their thrust against the yoke or collar blocks just described. (See Fig. 3.)

The fracture of the Umbria's shaft occurred in a very inconvenient place, namely, between two collars of the shaft, as indicated in Fig. 4. There were two distinct cracks in the shaft, the most serious one running diagonally from flange to flange on one side of the shaft. The first thing done on discovering the injury was to support the shaft by passing a chain cable under the shaft, which chain was secured to the steel beams above it. To enable these beams to take the strain they were shored up with timbers. Next, three holes were drilled through the collars of the shaft on each side of the break for the reception of large bolts. This was a work of great difficulty, owing to the limited space, and only five men could advantageously work at once. Shifts of five men each were employed, who worked night and day in six hour watches, operating with hand drills. The metal remaining outside the edge of the holes was chiseled away to permit the insertion of the coupling bolts, which were then dropped in and the nuts screwed up so as to strain the fractured edges of the shaft tightly together. In these operations it is estimated 180 inches of iron were drilled through. A clamp or strap was bolted around the shaft between the collar before the bolts were put in place. After the bolts were screwed up another strap was put around them, its flanges being turned inward. (See Fig. 5.)

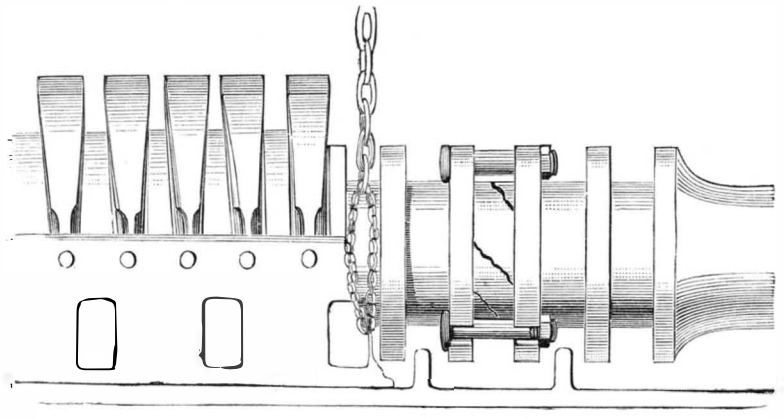

Fig. 4.—THE BROKEN SHAFT OF THE UMBRIA AS REPAIRED.

To get at the shaft collars and permit the rotation of the shaft after repairs were made, several of the thrust block yokes were removed. On the completion of the repairs the engines were slowly started, and the work done proved to be safe and successful, with the exception that, in the course of the first two hours, the head of one of the bolts flew off and a new one had to be inserted, causing several hours' delay. After this all went very smoothly, the ship making about nine miles an hour, and safely reaching New York on the night of December 30. The work of repairing occupied four days' time.

A very fortunate circumstance was the early discovery of the break. Chief Engineer Tomlinson noticed that the engine was not running truly and became suspicious; this led to an investigation on his part. Going over the line of shaft and lifting the covers of the first thrust box, the fracture was discovered and the engines stopped. The crack had not then penetrated entirely through the shaft, so that the alignment of the shaft was but slightly disturbed.

On the arrival of the ship in New York telegraphic communication was had with the owners relative to the permanent repair of the machinery. To effect this it would be necessary to remove and reheat the present shaft or put in a new one. This would occasion great delay. It was finally decided to make a temporary but more secure repair than that already made, and to take the ship to England, where a new shaft could be more quickly put in; while the vessel could at the same time be generally overhauled for the expected great passenger traffic of next summer, due to the opening of the World's Columbian Exposition.

The plan of final repair is as follows (see Fig. 6): The fractured portion of the main shaft is cut out even with the faces of two of the thrust collars. A short section of steel, corresponding in diameter to the shaft, and flanged or collared at both ends, is then set in to fill the space that was occupied by the fractured parts. The collars of the shaft and the collars of the inserted section are then strongly bolted together, as shown in Fig. 6. In this way it is expected a strong and reliable coupling can be made, whereby the ship may safely proceed to England. These repairs are now in progress, and in a few days the great vessel will move homeward.

Great credit is due to Chief Engineer Tomlinson, of the Umbria, for the skill and promptness with which the fracture was discovered and repaired.

In this connection, we have thought it would be of interest to show how broken shafts are ordinarily repaired at sea. Most of the steamers carry on board what is called the Thompson coupling. (See Figs. 7 and 8.) This consists of three strong, flanged cylindrical sections of steel, which bolt together, and when thus combined they grasp and hold the broken ends of the shaft firmly together, as illustrated in Fig. 8. Fig. 9 shows how the Thompson coupling was successfully applied to the main shaft of the large steamer Veendam, which suddenly gave way at sea, in May, 1891. In this case it was necessary to re-enforce the Thompson coupling by means of chains and wedges.

This coupling could not be applied in the case of the Umbria, owing to the fact that the break took place at the collared portion of her shaft.

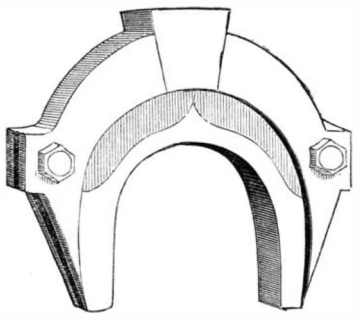

Fig. 2.—THRUST YOKE OR COLLAR BLOCK.

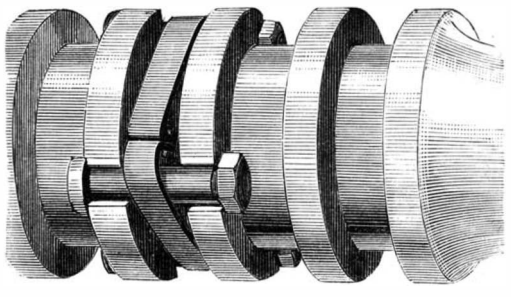

Fig. 5.—THE BOLTS STRAPPED IN PLACE.

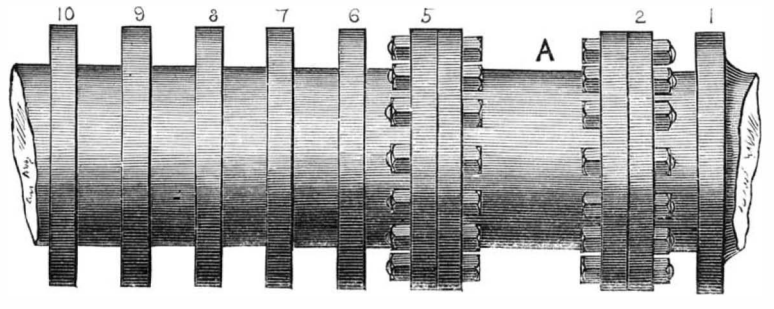

Fig. 6.—THE FINAL REPAIRS OF THE UMBRIA'S SHAFT.

Fig. 7.

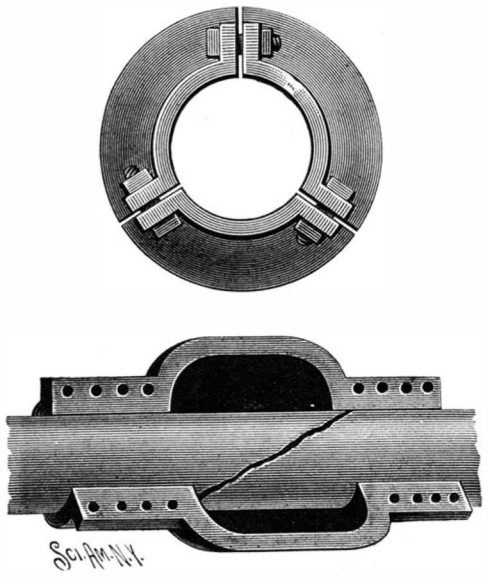

Fig. 8.—THE THOMPSON COUPLING.

ONE of the uses to which rubber has been put is for horseshoes; it is light and durable, and improves the hoof.

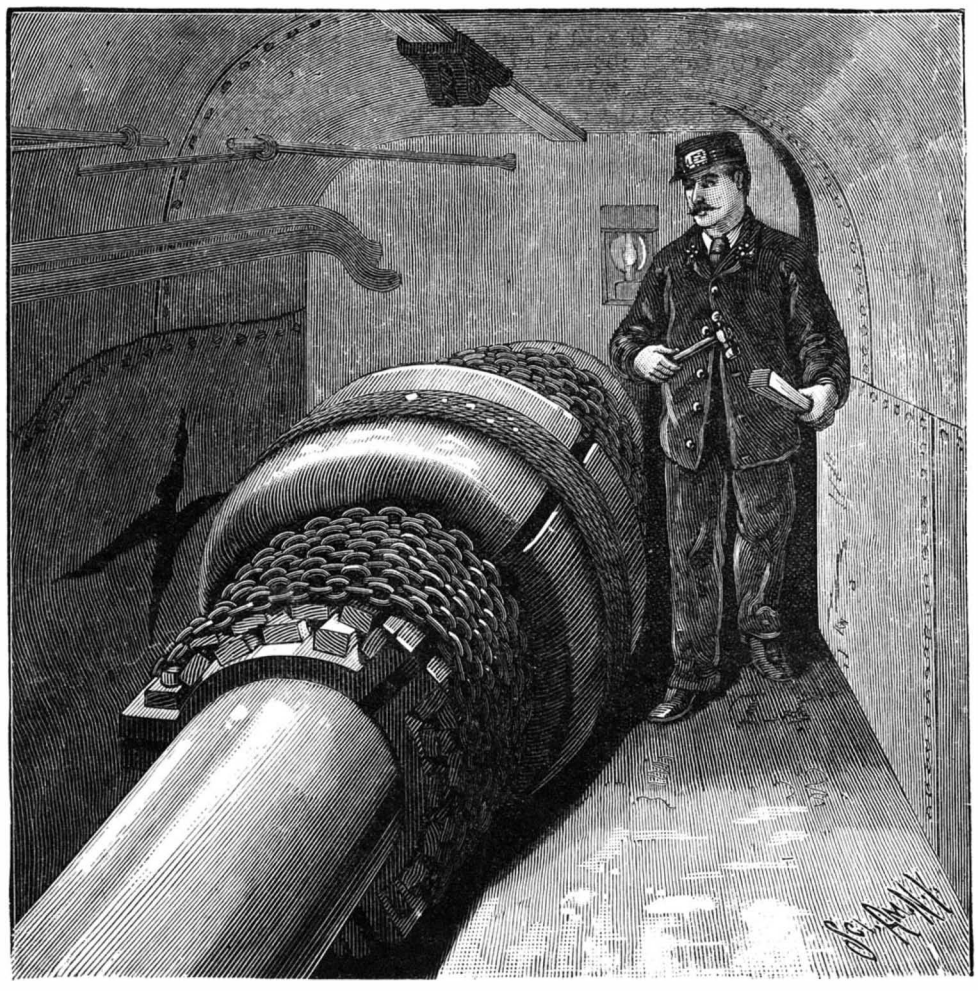

Fig. 9.—THE THOMPSON COUPLING AS APPLIED.

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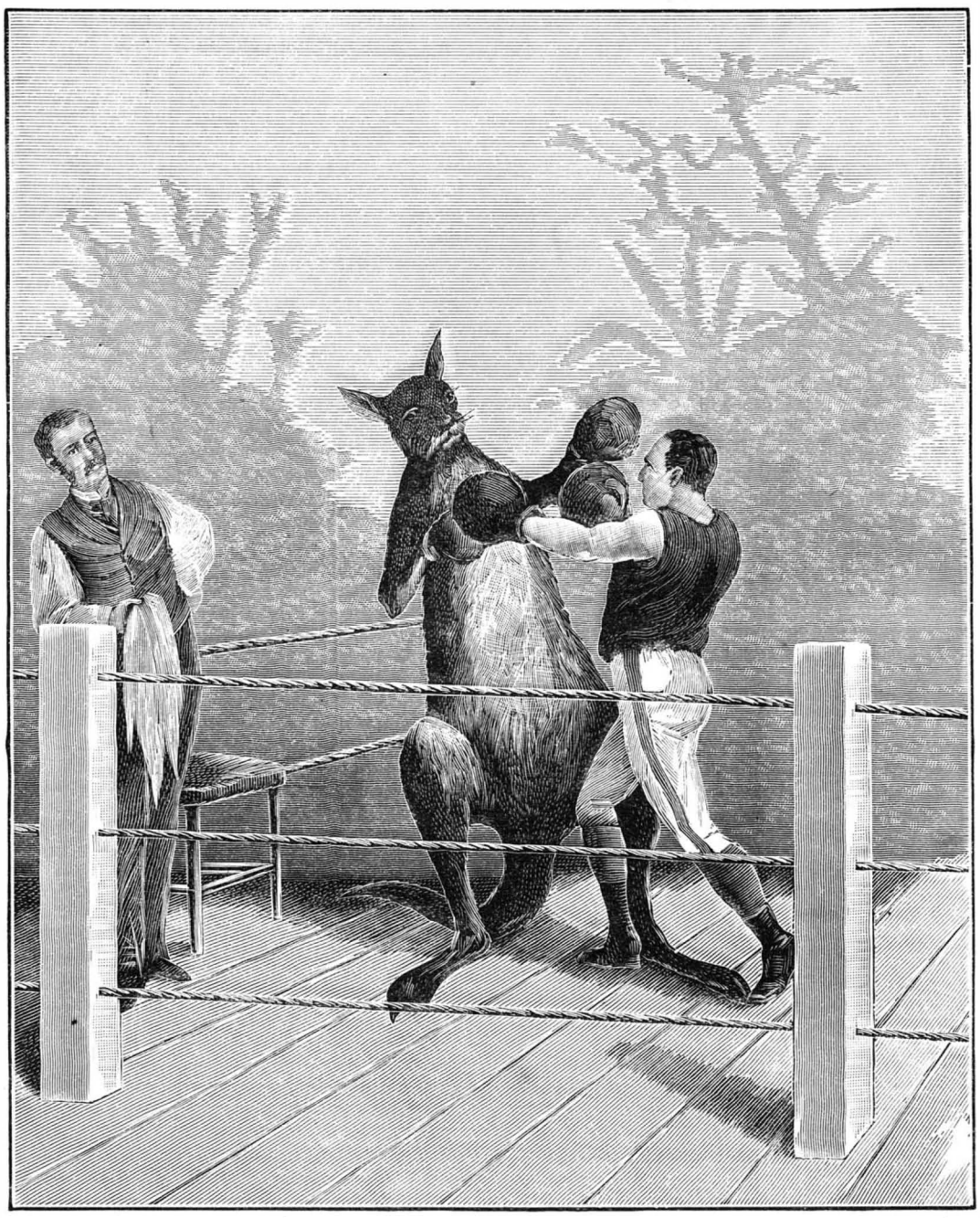
THE KANGAROO AS A PRIZE FIGHTER.

Among the recent developments in the world of sports, in Australia, is the training of the kangaroo to stand up and spar or box with a human antagonist. We give an illustration which we find in a recent number of *Black and White*. An exhibition of this curious kind of combat now takes place regularly at the Royal Aquarium, London, and it attracts many spectators.

The way in which the natural kangaroo spars in the bush, his birthplace, is peculiar. He places his front paws gently—almost lovingly—upon the shoulders of his antagonist, and then proceeds to disembowel him with a sudden and energetic movement of one of his hind feet. From this ingenious method of practicing the noble art of self-defense the kangaroo at the Royal Aquarium has been weaned. The clever instructor of this ingenious marsupial has trained it to conduct a contest under the conditions known as the Marquis of Queensberry's rules. It cannot be said that it adheres to these regulations quite so rigidly as the combatants who pummel one another at the National Sporting Club are required to do. On the contrary, it cannot wholly disabuse itself of the idea, favored by the French, though discountenanced by the English, that those who are attacked have as good a right to defend themselves with their feet as with their fists. It affects *la savate* in preference to *le boxe*, a predilection which, considering the force with which a kangaroo can kick, might quite conceivably cause an injury to his antagonist. However, no harm has as yet been done, and the encounter between human and marsupial is spirited and novel, and admirably illustrates the power of man to bend the brute creation to his will.

A writer in a recent number of the *Overland Monthly* advocates the importation and domestication of the kangaroo in this country. He gives authorities showing the feasibility of the project, and believes the animal could be introduced and raised here with profit. The flesh of the kangaroo is highly esteemed as a food, and from the hides a valuable leather is made. These are legitimate uses of the animal. But it is shocking to think of degrading so useful a creature down to the level and equal of a brutal human prize fighter.



THE KANGAROO AS A PRIZE FIGHTER.

How to Make a Gas Engine Noiseless.

Mr. P. Simon has been making a number of experiments with a view to deadening the objectionable noise made by the puffs of the exhaust pipe of a gas engine, and, after trying a number of different devices, he describes the following in a recent number of *L'Electricien*, which is such a simple device that it can be introduced by any one at a small expense. A pipe split for a distance of about two meters is attached to the end of the exhaust, with the split end upward. Beginning at the lower end of the cut, which may best be made by a saw, dividing the pipe into two halves, the slotted opening is widened out toward the top until it has a width equal to the diameter of the pipe. The puff of the exhaust spreads out like a fan, and the discharge into the open air takes place gradually. The effect produced is said to be remarkable, but it depends somewhat on the flare of the tube.

An Ink Monopoly.

James Eddy, it is said, of Troy, N. Y., makes all the ink with which the United States government prints its paper money. Mr. Eddy's father invented the ink, but he never told anybody how he did it until just before he died, when he let his son into the secret. Had an untimely accident gathered the inventor to his fathers before he told his son about the ink, the government printer would have been in a bad way, for Mr. Eddy's invention is the only kind of ink that will print on the peculiar surface of the fiber of which government note paper is made.

The present Mr. Eddy employs only six men in the manufacture of his ink, and none of them is in the secret. None of them has yet seen Mr. Eddy in the interesting act of mixing the ingredients of which the ink is composed. Mr. Eddy locks himself up in his own room two weeks in each year, and it is there and then that he mixes stuff enough to supply the government with ink for the ensuing twelve months.

The process of locking himself up surrounds Mr. Eddy with an air of romance something like that of the man whom Balzac made to search for the alkahest, the only difference being that the alkahest fellow shut himself up for a lifetime and got nothing, besides alienating the affections of his wife, while Mr. Eddy locks himself up for two weeks and gets $50,000 a year.

The widely circulated story to the effect that the man who invented rubber tips for pencils made $200,000 is contradicted by a Philadelphia paper. The original inventor, it says, got little or nothing. It was somebody else who got the money.—*Author unknown.*

An Alfalfa Crop.

From Bakersfield, California, comes the report of a yield of alfalfa which is hard to beat. E. Chauvin's place near Delano is watered from an eight-inch artesian well 704 feet deep. This gives a flow of 3½ inches of water, all of which runs into a reservoir, from which it is drawn for irrigation purposes as it is needed. Three years ago when the alfalfa was first seeded in a small field which he has, the yield was about one ton to the acre, but it has kept on increasing, until this year the product is really marvelous. After a cutting the alfalfa grows from an inch to one and a half inches a a day, and when cutting time comes around it takes four horses to pull the mower with ease.

The record thus far this season is this: April, 2 tons per acre; May, 2½ tons; June, 3 tons; July, 2¾ tons; August, 2¼ tons; September, 2 tons, a total thus far of 14½ tons per acre, with at least two more cuttings and probably more to hear from. It growth has been so rapid that it is now cut every twenty days or thereabout. There are thousands of acres in that vicinity which, if irrigated, will yield just as well as the land in question. This alfalfa is sold to sheepmen and others, and brings about $8 a ton. This high price is of course due to the location of the field, like an oasis in the midst of dry and unirrigated grazing lands, and would not obtain if the thousands of similar acres were also changed into alfalfa fields.

End-on Launches.

As nearly all vessels built in lake ship yards are launched beam-on, there is not so much computation necessary, but the incline of ways, thickness of grease, etc., are figured to a nicety when large steel merchant or naval vessels are launched on tidewater. Experience and guesswork are not sufficiently reliable where the safe delivery of a $1,000,000 or $2,000,000 hull is concerned. With mathematics and applied science the time required for a hull to travel from the blocks to the water can be figured to a second. On tidal waters the launch must take place exactly on time. Preparations are made for it, says the New York *Sun*, before the keel is laid. The incline of ways has to be figured, and it usually is from ½ to 1 inch to the foot, the heavier the vessel the less incline, of course. The City of Paris had ½ inch and the Columbia 13-16 of an inch. It was thought the latter would launch in 30 seconds, but it only required 29. Over five tons of tallow was used, and as it was very warm, about 15 per cent stearine was mixed with the tallow to keep it from running. The weight of the vessel and buoyancy of the water are important factors to be determined. When the vessel is half off the ways, their height from the water and their incline must be sufficient to continue the vessel on the same line of projection. If the vessel is so heavy that her forward part sinks into the water so that the stern is lifted from the ways, a strain is put on the decks amidships; and if, on the other hand, the buoyancy is greater than the displacement, the bottom of the hull is strained amidships.

Mr. Sheldon, now with the Globe Iron Works Company, Cleveland, has had a wide experience in launching vessels from European yards. He says that a simple method to determine if the hull has been strained in launching is to stretch a fine wire from stem to stern, having it fastened at intermediate points. If the hull is strained the wire will part. This is also done sometimes before machinery is placed in the hull.

When the hour for an end-on launch approaches, most of the props are taken down and the vessel rests on the keel blocks and one or two sets of stocks at the sides. The ways and cradle have been fixed in place and wedges have been adjusted above the cradle and under the poppet blocks on which she rests. Four men take care of four wedges. The signal is given and the men drive home the wedges. The vessel is lifted just clear of the keel blocks and rests on the ways. Alternate keel blocks are knocked away, beginning at the stern. Another "wedging up" follows, and then all the props at the sides are removed. After a rest the third wedging comes, and then all the keel blocks are knocked down, the word is given, and the planks that hold the cradle to the ways proper at the bow are sawed off, and the vessel starts down to the water. It requires about 600 men and it costs $5,000 to launch vessels like the New York and Columbia.

AT a recent trial in France it was shown that the chemist Turpin, who is undergoing five years' imprisonment for treason, made arrangements with a friend to carry on secret correspondence. A letter from the prisoner, giving the necessary directions to his friend, was read in court. An official inquiry was made, and some interesting information supplied by the convicts, from which it was shown that when private news was to be supplied to a prisoner, a formal letter apparently containing nothing of importance was sent. This being read by the governor would be passed on to the prisoner, who, understanding the missive, and that it was only necessary to read between the lines written in milk, he could make this perfectly decipherable by rubbing it over with a dirty finger or an old slipper. Another ingenious form of secret correspondence consisted of leaving letters out of words, as if the writer were illiterate. The omitted letters put together formed the requisite words and sentences.

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The Influence of the Climate of Japan on the Organism of the European.

BY DR. MICHAUT, OF YOKOHAMA, EX-INTERNE OF HOSPITAL.

The Archipelago of the Rising Sun, bounded on the north by the glacial regions of Kamchatka, extends almost to the Tropic of Cancer on the south, from which it is separated only by a distance of 10°. Hence the climate of Japan is necessarily variable, and presents, in accordance with the locality, a great disparity of conditions. At the south the mean temperature is 17° (with a maximum of 34·5°); oranges and bananas abound, as also the entire series of tropical maladies—diarrhœa, infectious fevers, dysentery, the anæmia of the torrid zones, etc. In the north of Japan the mean temperature is 8° (with a minimum of —23°), and here we encounter the flora of Norway and a considerable traffic in the furs of Siberian fauna, bear, otter, etc.

The central portion—from Nagasaki to Tokio—geographically speaking and considering its latitude, should rejoice in a temperate climate. Unfortunately, this climate is disturbed by oceanic and atmospheric currents, extremely variable in character, rendering absolutely capricious the weather of the seashore—the one part which has been opened to foreigners by treaty. The climate of Central Japan defies definition; its quality can be only approximately described by stating that it is maritime, humid, rainy.

An incredible variability, an atmosphere almost constantly saturated with moisture (save in winter and during a part of the autumn), an extremely long rainy season, persisting during almost the entire spring and summer; such is, in *resume*, the tableau of the climate of Central or Middle Japan.

The abrupt changes of temperature, with occasional variations in a single day of from 15° to 16°, render the climate specially disastrous to strangers predisposed to affections of the respiratory passages and of the lungs. The recurrence of the seasons and their climatic character, so devoid of regularity, render it impossible to determime definitely the proper season for the sojourn of foreigners in the region comprised between Nagasaki and Tokio. It may be said that in Japan, and particularly on the eastern coast, prediction of the weather is purely mythical, not only from day to day, but even from morning to evening.

In the following are given some official statistics, which present more definitely the actual facts:

METEOROLOGICAL OBSERVATIONS DURING 1890.

Average humidity of the atmosphere	78
Mean tension of aqueous vapor contained in atmosphere.	10·8°
Maximum temperature	+35·8°
Minimum temperature	—5·8°
Number of rainy days during the year	181
Number of days of cloudy weather	143
Clear days	43

Thus out of 365 days it rained during 181 days, the sky remaining clear during only 43.

The conditions thus resulting will have to be carefull guarded against by the European.

The almost constant saturation of the air with aqueous vapor (except in autumn and in winter) transforms the atmosphere into a humid hothouse, utterly unfavorable to the respiratory functions. For this reason the influenza nowhere found more victims than in Japan. Bronchitis, laryngitis, pulmonary tuberculosis are frequently encountered in the natives, as well as the resident Europeans. Among the natives the proportion of deaths caused by affections of the respiratory organs is positively unheard of.

On an average, 16 per cent of the deaths are caused by maladies of the organs of respiration. It is a curious fact that the rheumatismal affections, so extremely frequent among the Europeans inhabiting Japan, are relatively rare (0·91 per cent) among the Japanese, the natives owing this immunity to their peculiar hygiene more than to their heredity. The use of very hot baths, almost boiling, is a factor.

As to pulmonary tuberculosis, it is very frequent among the Japanese (especially the upper classes) and Europeans. "Among the Europeans the malady progresses much more speedily to a fatal *denouement* than with the native classes. Among the foreigners residing in Tokio and Yokohama the disease proceeds very rapidly, and this is convincingly shown by the registers of the Yokohama hospitals." This sentence, written several years ago by Dr. Vincent, chief physician of the navy, is only an expression of the simple truth. Every European predisposed to tuberculosis is destined to succumb quickly in Japan. It is, therefore, absolutely necessary, if one wishes to reside in Japan, or even to remain there several months, to undergo careful examination with respect to a possible eventuality of pulmonary tuberculosis. Without this precaution, one runs the risk of undergoing the frightfully rapid development of lesions previously latent. The climate of Central Japan presents excellent facilities for cultivating the bacillus of Koch. The cause will be readily understood on observing the abrupt thermometric variations not only of season (or rather, of monsoons), but of consecutive days.

Pneumonias are more frequent than pleurisies. As for the laryngites, they are particularly tedious and difficult to cure. Often a resulting aphonia is present.

The following is a statistical table of maladies of the respiratory organs occurring in the native born:

Number of deaths: 1884, 104,260; 1885, 136,985; 1886, 132,565; 1887, 126,332; 1888, 128,613; 1889, 134,882.

Next to the affections of the nervous system, the maladies of the respiratory organs produce the greatest number of deaths. The former, however, are daily increasing in frequency.

The European sojourning in Japan is particulary affected through his nervous system and his respiratory organs as a result of the humidity and the abrupt changes of temperature.

1. Effects on the respiratory apparatus: The number of movements is augmented. The tension of the aqueous vapor being very great, that of the oxygen is diminished with resulting reduction in hæmatosis, thus opening the door to all maladies through depression of nutrition—from rheumatism and diabetes to gout and anæmia, which are everyday diseases in Japan. Contrary to the prevailing notion, Central Japan possesses a climate exceedingly favorable to the development of anæmia.

2. Effects on the nervous system: The climate of Japan, through its humid heat, depresses the nervous system. Hence diminution of physical activity, enfeeblement of the cerebral faculties, followed by apathy, somnolence, and complete prostration of the powers. Such are the different phases experienced by a European residing in Japan.

In order to withdraw from the pernicious influence of the climate, the foreigner must endeavor to spend the summer at the north—at Yeso or in the north of Niphon—where the climate is dry and invigorating.

In brief, the climate of Japan, like many countries of the remote Orient, is far from healthful for Europeans. The acclimatization of Europeans in Japan necessitates certain hygienic precautions, which will be set forth in a later article.

In a general way we may simply add that, while superior to the climate of Cochin China and India, the climate of Japan is inferior to that of Tonquin in many respects.—*Bulletin Generale de Therapeutique.*

Traveling in America Sixty Years Ago.

In 1833, 1834, and 1835 the actor Tyrone Power visited America, and his observations on the United States were published in two volumes. To-day, after the lapse of nearly sixty years, the book is most interesting reading. The time of his visit was the beginning of the steamboat and railroad age. Fulton's work had begun to produce worthy effects, and the construction of railroads was just beginning. It is hard to realize the difference these sixty years have wrought in the countenance of the land.

Power appears to have been a great sailor, and his thirty-five day trip across from England was quite to his taste. After the ship sighted Barnegat Light the probabilities of reaching New York the next day were the subject of wagers. The ship then did manage to get as far as the entrance of the Narrows. Here, to accelerate matters, a party of the passengers engaged the pilot boat to take them to Staten Island. They left the slower sailing ship behind them, and as they got in toward the island hailed the ferryboat, which was just starting. She changed her course for them, took them on board, and at last the city was reached.

The Bowling Green reminded our traveler of Cape Town, Broadway of the Boulevards of Paris. In the Battery Park, the next morning, he found a party of emigrants camped out in the open, where they had spent the night. Three hours later he sees the same family, with their belongings packed on a clumsy wagon, going up Broadway, their first step on a journey of two thousand miles that was before them.

On September 11 he starts off for Philadelphia by the "Camden and Amboy line of steamboat and railroad." Going through what he calls Raritan or Amboy Creek, now Staten Island Sound and the Kills, he reaches Amboy and takes the train. The "loco-motives" not being in condition to do duty, they start off with horses at the rate of about eight miles an hour. At Bordentown the railroad stopped, and our traveler completes his trip by steamboat. Water service was decidedly ahead of land service. Philadelphia was reached in darkness, and here he was assailed during the watches of the night by what he calls "those incarnate demons, the moschetos," which "did hum and bom and bite and buzz."

His return to New York only took seven hours, and at 5 P. M. he started for Boston on the noblest steam vessel he had yet seen. At seven the next morning the steamboat reached Newport, went on to Providence, and there he took a stage coach for Boston, reaching it at half-past three, doing the forty miles of road in five hours. The whole trip from Philadelphia took thirty-two and one-half hours. Hopes, however, were held out that when the railroad to Providence should be completed and an improved steamboat should be put on the route, eight or nine hours might be deducted from the time between Boston and New York.

He returns to New York, and on October 8 starts off with the lark for Philadelphia. At Amboy, as before, he took the train, and "every one was delighted to find that the locomotives were now in operation." They start, and make various surmises as to the rate; some calculated it at twenty miles an hour. In the midst of this discussion an alarm is given from the rear and loud cries of "Stop the engine!" come from the windows of every carriage upon the train. One of the rear coaches had broken an axle, and several passengers were killed and injured. The ex-President of the United States, "Mr. Quincy Adams," was on the train. By his direction an inquest was held upon the deceased and the train moved forward to Bordentown. Philadelphia was reached late in the afternoon.

He traveled several times between Philadelphia and Baltimore by steamboat without adventures worthy of record. Again he is in New York for the New Year's Day of 1834, and at 7 A. M. on January 12 starts off again for Philadelphia. This time the steamer went to Amboy by the route outside of Staten Island to avoid the ice. Soon after starting on the train an axle of the tender broke. The engine was "speedily arrested." A sound axle was drawn from a car to replace the broken one. The car that supplied the axle was drawn out of the line, its passengers were put into the other cars, and the train went on. The railroad this time takes them eight or nine miles beyond Bordentown, where a dozen four-horse coaches are in waiting. The steamboats were not running on account of the ice.

The real terrors of the journey now began. The coaches first traveled through a narrow lane, with ruts over a foot deep. Mr. Power rode on top of the coach, and was kept busy dodging the branches of trees. The driver kept speaking of the great road soon to come, but here our traveler concluded that if his head was safer his neck was in greater peril. The frozen ruts were so bad that he fully expected the driver to give it up, but he coolly steered around all impediments. In one case he abandoned the road for a hundred yards, crashing through shrubs breast high on the right bank, where the other coaches followed him. Our traveler, who was a fox hunter among his other accomplishments, says one could almost back one of these coachmen to take his coach across country after the fox hounds. At Camden, with much trouble, the frozen river was crossed and Philadelphia was reached at four in the afternoon.

Another striking description tells of his journey from Baltimore to Washington. For this a special coach was chartered by their party, and about 9 A. M. they started. Although in winter, the air was mild as in May. The turnpike was reached—he can compare it to nothing. He says that a Cumberland fell plowed up at the end of a very wet November would be the Bath road compared to it. He looks along the "river of mud" with despair. Some of the holes they wallowed through he thought would swallow the coach. Sometimes three of the horses were down together, but his driver, Tolly by name, felt "pretty certain the coach must come through, slick as soap." After nine hours' hard driving the Capitol at Washington appeared in sight. A steep hill faced them. A road that "looked like a river of black mud" went up one side; the other side was seamed with tracks, where coaches had deserted the regular road. They, too, tried across country, as our traveler calls it, and at last reached the capital, leaving two coaches, which had left Baltimore three hours before them, "hopelessly pounded in the highway; regularly swamped within sight of port, for the capital was not over three or four hundred yards from them." The unfortunate passengers were all out assisting to unharness and unload, designing to use both teams before a single vehicle, extricating one at a time.

The Pennsylvania Railroad for the past few years has been improving its roadbed. The curves have been straightened and better time to Washington is promised. We are told of the time saved by straightening a single curve, perhaps the fraction of a minute, but it is thought well worth the cost. Similar improvements are being executed by the Baltimore and Ohio Railroad, the cutting off of fractions of minutes being aimed at. The sum total of time to be saved can be but a few minutes, or perhaps half an hour at the best. How striking is the comparison betweeen Power's nine hours' drive from Baltimore to Washington and the efforts of modern engineers to cut off five minutes from the modern railroad journey of three-quarters of an hour between the same points!

A NEW developer has been recently introduced to the public under the name of glycin. It is obtained by the action of chlor-acetic acid on amido-phenol, and is a pulverulent mass, readily soluble in water, to which a small quantity of alkali has been added. The solution thus formed is almost colorless, and keeps well by the addition of sulphite of soda. The following are two formulæ suggested by Dr. Eder: Glycin, 5 parts; sodium sulphite (cryst.), 15 parts; potassium carbonate, 25 parts; water, 90 parts. For use, dilute with three to four volumes of water; or glycin, 3 parts; sodium sulphite (cryst.), 15 parts; sodium carbonate (cryst.), 22 parts; water, 200 parts. Use full strength. Glycin is a slow developer, giving exceptionally clear whites, and promises to be of use in photo-mechanical work.

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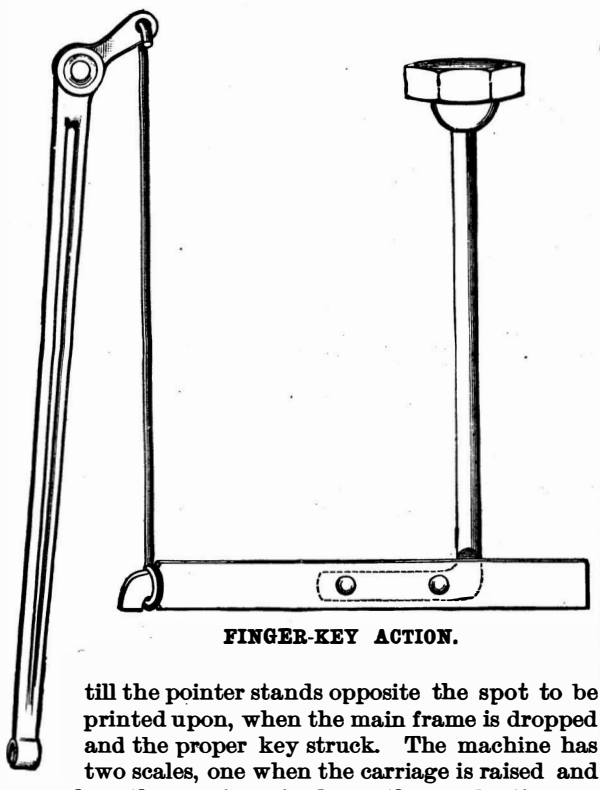
THE "NATIONAL" TYPEWRITER.

A standard, high grade typewriter, designed to embody all the good points of the best instruments, while possessing many special points of superiority all its own, is shown in the accompanying illustrations. It writes 81 characters, including capitals, small letters, figures, punctuation marks, commercial signs, etc., with only 29 keys to learn and manipulate. The machine occupies a space of only 9 by 12 inches, and 7½ inches high, weighing about 13 pounds. It has a comparatively small number of parts and is strongly made, the strong points claimed for it being simplicity, durability, portability, accuracy, speed and wide range of usefulness and utility, while it is almost noiseless.

The keyboard of the instrument is practically the same as that of other standard machines, operators upon which can at once use the "National." The carriage is a fixed portion of the machine, having a longitudinal motion only; it is not hinged, weighs only about 20 ounces, and can be pulled or pushed back toward the beginning of the line at any point without touching a release key. Paper and envelopes can be fed through without raising the carriage. It will run backward and forward while raised as well as when lowered, so that all errors or omissions can be practically corrected in sight. No. 15 indicates the envelope and paper guide; "L. G.," the line gauge; 13, the carriage indicator; 11, the scales; and 37, the automatic pointer or tabulator. The pointer moves to and from the printing point as the main frame upon which the carriage moves is raised and lowered, and for a correction the carriage is moved

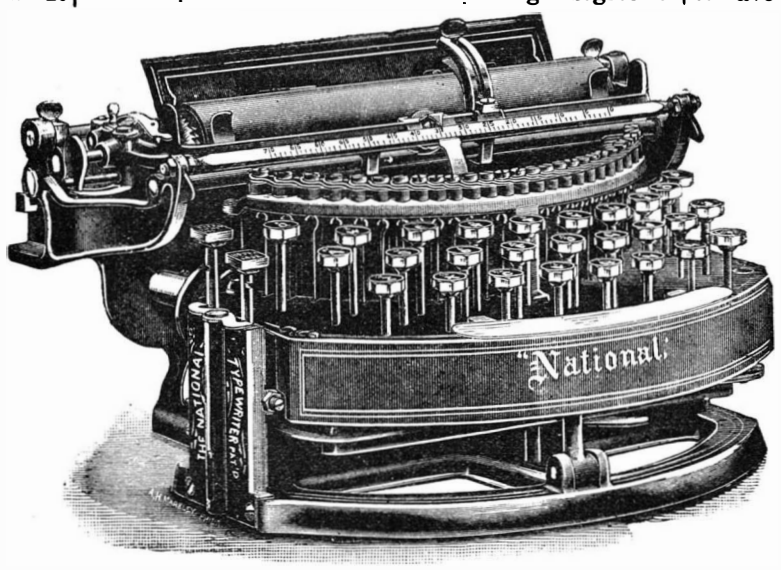


FINGER-KEY ACTION.

till the pointer stands opposite the spot to be printed upon, when the main frame is dropped and the proper key struck. The machine has two scales, one when the carriage is raised and one when the carriage is down, the graduations on both scales running in the same direction.

For manifolding work this machine offers distinct advantages, doing heavy manifolding or single copy work in the same alignment, without change in the machine, the alignment being unaffected by increased number of sheets. This is due to the direct, steady action of the type bars, which are arranged and swing in less than a half circle. The finger key action, shown in one of the views, is very simple, having practically but three simple pieces of strong steel, without any of the delicate and complicated wooden levers, compound levers, toggle joints, etc., and the keys are so supported that they do not wobble or warp out of position.

The ribbon movement is simple and automatic, 44 indicating the ribbon shift handle, and 62, 65 and 17 the ribbon spools and ribbon supports, 31 being the ribbon spools ratchet wheels, 28 an adjustable ribbon stud, and 39 a spring-impelled drum. The ribbons can be changed instantly without soiling the hands, the spools on which the ribbon is furnished being readily removable. It is entirely practicable with the machine to write a document in two or more colors of ink. An adjustable paper shelf assures regularity of margin, marginal stops being instantly adjustable on the carriage way, 51. The lifting main frame is indicated by No. 30, the handles being indicated by No. 35, and No. 22 marking the feed roll. In the back view of the frame is shown the bell-operating mechanism, 26 being the bell ringer, 29 an intermediate bell pawl, 40 the bell ringer wheel, and 67 an intermediate bell pawl stop. The bell can be set to ring at any point from 5 to 70 on the scale. The "National" is the result of a high degree of inventive talent and mechanical skill, as developed by years of practical experience. The "National" is one of the machines employed in the office of the SCIENTIFIC AMERICAN, and its operation gives much satisfaction. It is manufactured by the National Typewriter Co., 715–719 Arch Street, Philadelphia, Pa.



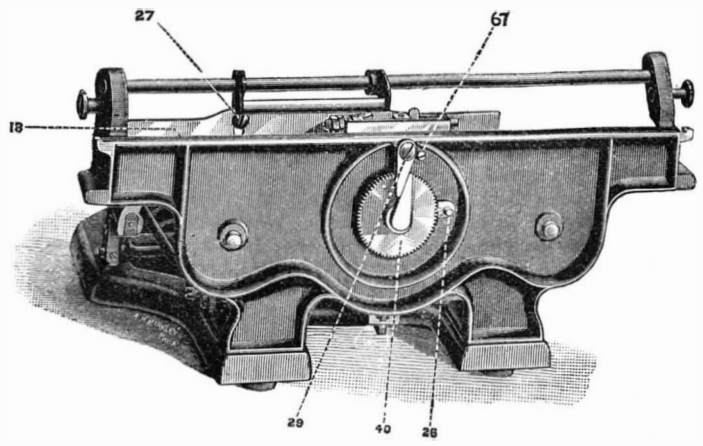
THE NATIONAL" TYPEWRITER.

How Needles Are Made.

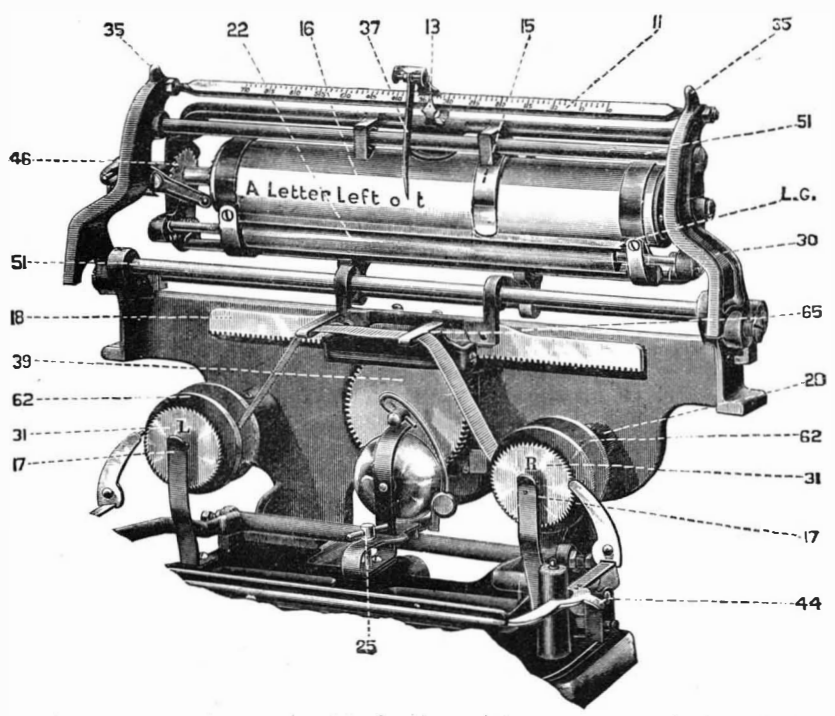
Needles are manufactured out of superior quality of cast steel wire cut into lengths to make two at a time. Pieces are straightened upon an iron table by means of an instrument termed a "rubbing knife." The wire is then pointed by automatic machinery provided with a fan or shaft to carry away the steel and grindstone dust, which is very injurious to inhale. In former days the lives of workmen employed in the needle trade were considerably shortened by breathing air charged with particles. Indeed, the following is a narrative told by a doctor in the district of the industry concerning a patient, a hand needle pointer by trade, who complained that he felt a hard ball of something in his trachea, which rose and fell between his chest and throat. The doctor ridiculed the idea and told him it was nonsense, but the man still persisted it was there, and asked him if he died to examine him. After the poor fellow's death a post mortem examination was made and resulted in a solid mass of steel and stone dust about the size of a bird's egg being found, as he had said, in his throat, and the lungs were so encrusted with steel that a knife would scarcely pierce them. It was therefore truly a blessing to these busy workmen when this deadly process was done away with, and in its stead a healthy one substituted.

After the operation of pointing, the wires are stamped and then pierced to form the eyes. As the diameters of the wires used in this industry are usually very small, *e. g.*, 0·03 of an inch, it will be readily apparent that the above process involves considerable accuracy and skill. The "burrs" produced by stamping are afterward removed by means of flat grindstones called filing machines. A "spit" of these double needles is next placed between a hand vise, termed "clams," and divided into single ones, requiring only to have their heads "rounded" by filing to furnish the complete articles. A finished needle, however, must have a hard and elastic temper, whereas these, in their present state, are softer than the wire out of which they were made. Therefore, after the needles have been burnished in the eyes, they are hardened by heating in an oven, and subsequently cooled by plunging them into oil. This rapid cooling of the steel makes it as brittle as glass. The needles will now almost break upon touching them; indeed, in this condition they would be as useless as in the soft state. To reduce them to a perfect state of elasticity, temperature has to be again raised about 600 degrees, and then by allowing them to cool gradually the required degree of elasticity is obtained. During the process of hardening, the fire makes many of the needles crooked, and these have to be picked out and straightened by a small hammer, one at a time, on an anvil. The heads are afterward softened by the application of heat for facilitating burnishing. The process of scouring the needles bright takes about a week. They are mixed with oil, soft soap and emery powder, wrapped in loose canvas, and placed in a kind of mangle worked by mechanical power. This scouring process done, the needles are washed in hot water and dried in sawdust.

The points, slightly blunted by passing through the various processes described, are now set upon a small revolving grindstone and the eyes reburnished. The next operation is that of polishing the needles, and which is performed by a rapidly rotating wheel covered with prepared leather. The needles are caused to pass many times over the leather in order to thoroughly polish them. Finally they are counted and stuck by women into cloth, wrapped in paper, and labeled for the market.—*Chicago Journal of Commerce.*



"NATIONAL" TYPEWRITER—BACK VIEW OF FRAME.



NATIONAL" TYPEWRITER—NUMBERED PARTS.

Automatic Letter Express Delivery.

The London post office has just placed in front of the Royal Exchange, as an experiment, an automatic boy which is intended to be an adjunct to the express delivery of letters and parcels. By dropping a penny in a slot, the purchaser obtains an outer envelope, inclosing a small white envelope and card, on which the desired communication may be written, resting upon a small desk which falls from the front of the box. At the same time an electric bell calls a messenger from the nearest post office, which is Threadneedle Street. If it be desired to forward a parcel by express delivery, the arrival of the messenger must be awaited, but a letter may be deposited in the message receptacle for immediate dispatch. The necessary fee has in each case to be inclosed in the envelope bearing the name of the addressee, and should the payment be insufficient he will be required to pay simply the difference. For this service ordinary postage is not charged, and the fees specified in the scale, which are at the rate of 3d. per mile, include train and omnibus fares. If the sender requires a cab to be used, the fare must be inclosed in the outer envelope, which has to be marked "By Cab."

THE London *Lancet* thinks it is about time for people "to set about clearing away the miserable sepulchers which abound throughout the country under the name of bath rooms, and to construct rooms for the performance of their daily ablutions in harmony with the importance and necessity of bodily cleanliness."

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RECENTLY PATENTED INVENTIONS.

Engineering.

LOCOMOTIVE SIGNAL AND BRAKE.—Samuel J. K. Hassall, Penrith, New South Wales. This invention provides a mechanism by which the brakes will be applied and a whistle sounded automatically by a danger signal, the apparatus to be applied to any locomotive, and connected with an air-pressure brake. A part of the invention consists of an adjustable or striking plate or bar to be placed on the side of the line, the contact of the apparatus with such plate causing the brakes to be applied and a whistle to be sounded. The striking plate is placed some distance in advance of the ordinary signal, and is so connected as to always give the alarm and apply the brakes on a train approaching a signal set to indicate danger.

SIGNAL WHISTLE. — William M. Smouse, Gettysburg, South Dakota. This is a simple form of locomotive whistle more especially designed to automatically sound a signal on the approach of the engine to highway crossings or other places. A valve connects the steam supply with a cylinder containing a piston, or with a port leading to the whistle proper, and crossing an apertured plate moving with the piston. A downwardly extending rod carries a friction roller adapted to travel on a plate placed alongside the rail near crossings, whereby the whistle is automatically operated, requiring no attention from the engineer, while the sounds or blasts can be varied for any desired signal.

SPARK ARRESTER.—John E. Zimmerman, Trinidad, Col. Within the smokestack, according to this invention, are top and bottom cross bars which support a central vertical rod, around which is secured a spiral wire netting sheet, contacting at its outer marginal edge with the inner walls of the stack. All sparks and cinders passing upward are thus so interrupted in their movement, and kept so long a time in the smokestack, that they will be extinguished or broken up.

Railway Appliances.

CAR AXLE BOX.—John Donnelly, Brockley, England. The axle box shell consists of a corrugated and embossed steel plate, bent to box-like form and welded at the abutting edges, while a cast iron liner or distance block is adapted at its under side to form the journal brass bearing, being hollow to serve as a grease box if required, and having flanged ends and sides fitting against the top of the box, with a central post also bearing against the top of the box directly beneath the carrying spring. The top of the shell on which the carrying spring bears is thus so supported as not to be exposed to any bending strain, a direct crushing strain only being transmitted through the metal.

CAR COUPLING.—Henry Gallager, Savannah, Ga. The drawhead of this coupler is formed with an inner longitudinally extending face containing a vertically disposed semicircular recess in which turns a half bolt connected with an arm and pin, a rod connected with the arm reaching to one side of the car, and there being means for locking the arm in place. The construction is simple and durable, and the coupling is effected automatically, it not being necessary for the trainmen to step between the cars.

CAR COUPLING. — John H. Crumb, Burlingame, Kansas. Combined with a drawhead having cavities for receiving an ordinary link and holes for the link pins, and provided with a nib, is a spring-actuated hook to engage the nib on the coupling of an adjacent car, the hook having shoulders to engage the spring to hold the hook either open or closed. The coupling is automatic, and may be uncoupled from either the top or side of the car, and may also be used as an ordinary coupling, using a link, while provision is made for simultaneously closing the air brake pipe with the uncoupling of the coupling.

Mechanical.

CRUSHING ROLL. — Daniel Brennan, Jr., Bayonne, N. J. This invention relates to rolls consisting of a center or core and a removable shell which may be renewed when worn, the improvement providing for the accurate and secure fixing of the shell to the center without the necessity of boring the shell. The invention embraces a novel manner of arranging and securing the wedge blocks, a keeper assuring the proper position of the shell longitudinally of the center,

BOLTING REEL. — Cyrus Bolenbaugh and Ezra B. Wagner, Warsaw, Ind. A series of cylindrical agitator plates is fixed to turn on the main shaft, but without longitudinal movement, while a separate and independent outer bolting cloth frame is supported at its ends from the shaft by springs, a reciprocating sleeve or collar on the shaft reciprocating the bolting cloth frame against the action of its springs. The invention also embraces other novel features designed to form a bolting reel of simple and durable construction which will efficiently grade the material passing through it.

BRICK CUTTING MACHINE. — Charles T. Fitch and Andrew Schantz, Perth Amboy, N. J. Levers are fulcrumed at the sides of a main table on which slides a feed table, there being a connection between the levers and the feed table, and a cutter comprising a head is connected with the levers, while a shaft is journaled in the frame and wires are stretched between the head and the shaft. The cutters are actuated directly from the levers, and the feed table indirectly. The blocks of clay as soon as cut are automatically pressed from the cutters and delivered to a table, to be removed thence for drying.

STAVE JOINTING MACHINE.—William J. Wright, Cooperstown, Pa. This invention relates to a former patented invention of the same inventor, providing improved means for operating the bilge-forming devices. The bilge formers are held to reciprocate on a main frame, and the drive shaft is formed with a gear which reciprocates a rack frame, normally held out of operative connection, while lifting devices arranged to be operated by the passing stave are operated to throw the rack frame in mesh with the gear, in connection with means for carrying the stave. To cut staves for barrels of uniform length but different diameters it is only necessary to place between the guides formers having the proper bilge gauge.

SAW.—Albert Smith, New York City. This invention consists of a spring-pressed guard fitted to slide alongside the saw blade, the rear end of the guard pressing against a coiled spring in a tube in the handle of the saw. The improved implement is more especially designed for cutting keyholes in doors, etc., the operator taking hold of the guard to guide the saw.

Agricultural.

TURNING PLOW.—Philip J. Ebersohl, Centreville Station, Ill. This invention provides a quickly and easily applied plow attachment which will effectually serve to turn weeds, stubble, corn stalks, etc., under the ground. It consists of a spring-pressed shaft adjustably attached to a face plate and carrying a turning fork whose lateral movement is regulated by a stop mechanism, a drag being connected with the fork. The attachment is readily adjusted to any desired position, or it may be lifted from the ground and from close proximity to the mould board when necessary.

SEED PLANTING MACHINE.—Robert B. Snell and Burton Smith, Monument, Kansas. A combined disk harrow and seed drill is, by this invention, provided with a novel form of feed regulator and delivery tube, the lateral being flexible, longitudinally adjustable, lock-lapped, of sheet metal, formed of a single piece and coiled spirally, with edges folded toward each other in manner to form a lock. Combined with the seed hopper also are parallel movable gauge strips in its bottom, having zigzag edges and a spring for holding the edges in contact.

HARVESTING MACHINE.—William J. Randolph, Millersville, La. In this machine the cutting mechanism and binding table are arranged in front of the main drive wheel, so that the grain need not be elevated to carry it to the binding table, and the drive wheel can be made large in diameter and wide to readily pass over soft ground, the machine being especially adapted for harvesting rice, as well as grain of any description. The invention also covers other novel details and combinations of parts.

Miscellaneous.

CARBURETOR. — William and James Falley, Lafayette, Ind. The enrichment of natural gas by supplying it with sufficient hydrocarbon to render the gas fit for illuminating purposes is the especial object of this invention. Instead of the gas being directed over a carbureting liquid, or through perforated absorbent partitions saturated with such liquid, a carbureting vessel is provided in which the gas enters at the top of the casing, passes downward and then up through a perforated plate, through the body of the liquid hydrocarbon, to the outlet at the top. The hydrocarbon liquid is by this process kept constantly agitated, facilitating the taking up of the good qualities of the liquid by the gas.

GENERATOR.—William R. Macdonald, Allegheny, Pa. This invention provides a heater having a fire box and water tubes and water compartments, a steam generator being arranged in the water heater and heated from the fire box, while the pipes of an ammonia gas generator extend into and through the water tube compartments and steam generator to derive the necessary heat to produce the gas. This generator is designed to comfortably heat and cool and supply fresh air to apartments, the pipes and radiators used in winter for heating being employed in summer for refrigerating purposes.

PILE PROTECTOR.—John W. Lowman, Vicksburg, Miss. According to this invention the head or face of the pile is provided with a woven wire facing, which is incorporated with the impact face of the pile by the first blow of the hammer, the fibers of the pile retaining the facing in place, and the latter preventing the splitting of the head of the section.

HOSE BRIDGE.—John H. Gloninger, Pittsburg, Pa. This invention provides a device for supporting a hose at an elevation, to provide a passage beneath for vehicles, street cars, pedestrians, etc., without interfering with the flow of water through the hose. The device has pivotally connected and vertically adjustable legs, with tackle, hoist block and cable, guide ropes being attached to the legs, and clamps for engaging the hose. The device can be quickly set up, and may be folded into compact form and small space for convenient transportation and storage.

HOSE NOZZLE GUIDE.—James N. Brewster, Coney Island, N. Y. According to this invention a ball having a through bore to receive the nozzle is fitted in a suitable support or socket in the wall of a building, or partition of a room, or the deck of a vessel, etc., to permit the insertion of a hose nozzle, so that the water may be directed to the interior and the fire successfully attacked without the necessity of the firemen entering the room or apartment, and the draught occasioned by opening doors will be avoided. The diameter of the ball is according to the thickness of the wall, and the socket and ball embody several novel features.

MINE CAR.—Homer Durand, Starkville, Col. This car has the bottom of its body extended beyond the ends, the extension being cut away at the center to form two projections adapted to engage and open a door in a mine shaft, as the car travels down the track in the shaft.

GUN STOCK ATTACHMENT.—Ralph Townsend, New York City. This is a device to check the recoil of the gun, and consists of a band of yielding material surrounding the butt, a rigid stock plate being connected with the band at its outer margin, and ports of elastic material extending forward from the inner face of the stock plate, an air chamber being formed between the butt of the stock and the rear end of the device, and the chamber having outlets or vents through the band. The device may be readily applied to any gun, and when used the recoil will have little or no effect upon the shoulder.

CABLE CUTTING DEVICE.—John Squires and Charles Petrie, St Johns, Newfoundland. A lever is fulcrumed upon a hanger adapted to travel on the cable, the hanger carrying a knife having a sliding movement and connected by a link with the cable, and the lever being connected at one end to a cord. The device is designed to be sent down a cable to a point near the anchor, when by pulling on the cord the cable may be cut close to the anchor, in the event of a sudden storm or emergency when there is not time to heave up the anchor.

VENDING MACHINE.—Adolph F. Schneider, New York City. The mechanism of this machine is simple, compact and durable, and the machine is designed to deliver merchandise of any description. The construction is such that if the delivery mechanism is operated when a coin has not been placed in the machine no injury will result, and should one or more coins become fastened in the throat of the machine the operative mechanism will not be in the least affected.

FENCE.—Alfred P. Le Gros, Louisville, Ky. This invention relates to fences to be made from cast or stamped sheet metal, as distinguished from a twisted wire fence. Loop or strap-like connections are made to freely link together the body parts of adjacent sections, while picket-like legs at one end of each section have eyes or loops in which enter pintle-like projections. The fence is mainly designed as an ornamental border for flower beds, etc., the sections being easily fitted together and quickly erected.

TUNING PIN. — William A. Smith, Butte City, Montana. This pin has a tapering shank fitting at an angle in a conical slanting aperture in the metallic backing of the frame, the small end of the shank being threaded and engaged by a nut abutting against the rear surface of the backing. The pin is not liable to turn in its bearings, is cheap to manufacture, is arranged to take up wear, and adapted to keep the instrument in tune for a long period.

TWINE HOLDER.—John E. Tracy and Arthur N. Graham, Chicago (No. 162 East Washington street, room 62). This is an improvement in suspensible holders for receiving a ball of twine, the device freely delivering the twine as required for use, and automatically winding up the slack strand, to prevent waste or inconvenience from the trailing end of the twine ball lying around in the way.

IRONING TABLE.—Richard D., Philip and Charles Voorhees, Flora, Ind. This table has two pivoted legs, one folding within the other, a brace bar of a spring character connecting the lower portions of the legs, whereby the board may be quickly opened in position for use or folded in compact form.

RECLINING CHAIR.—George Weber, New York City. This invention covers various novel details of construction and combination of parts for a chair of commodious form and shapely appearance, the adjustment of parts being readily changed to make it into an arm chair, a rocking chair, an extension reclining chair, or a couch, the members being also adapted for compact folding together to facilitate storage or shipment.

CLOTHES LINE SUPPORTING LINK.—Andrew Brunner, New York City. A wooden link bar longitudinally slotted is diagonally severed through one of its members, and strengthened at the ends by transverse pintles having washers, the pintles forming supports for pulleys. The device forms an inexpensive link connection for two strands of an endless clothes line, traveling upon the upper and sustaining the lower strand, whereby the hanging of clothes upon or removing them from the line is facilitated.

BUST FORM.—Ellen Donnelly, New York City. A casing, preferably filled with mixed cotton and sawdust, is shaped to simulate the human figure, including the arms, and extending upward in the casing is a standard with a cross-bar, the arm sections having a ball and socket connection with each other and with the cross-bar. The form thus made is desirably elastic and yielding, and the arms may be manipulated somewhat as a human arm.

PUZZLE.—Henry F. Keil, New York City. In a flanged or dished board or plate, adapted to be oscillated or reciprocated by the hand, is held a number of balls of various sizes and one large hollow ball, of sufficient size to permit the smaller balls to enter and be held in it. The game of puzzle consists in keeping all the balls in motion, and causing the smaller ones to enter and be held in the larger one.

DESIGN FOR A WINDOW SHADE.—William F. Patterson, Jersey City, N. J. This design consists of a pictorial representation of the landing of Columbus, surrounded by a border of combined scroll and leaf like character and shielded like figures.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

ELECTRICITY AND MAGNETISM, BEING A SERIES OF ADVANCED PRIMERS OF ELECTRICITY. By Edwin J. Houston, A.M. New York: The W. J. Johnston Company, Limited. London: Whittaker & Co. 1893. Pp. 306. Price $1.

Professor Houston in this work really produces a concise treatise on the titular subject. The book purports to be a series of advanced primers, so we presume the eighteen chapters are each to be considered a separate primer. The last chapter, a sort of *resume*, is termed a primer of primers.

THE PRINCIPLES OF PATTERN MAKING. By a Foreman Pattern Maker. London: Whittaker & Co. Pp. viii, 178. Price 90 cents.

This work is one of decided merit from the eminently practical treatment of the subject, the number of illustrations used and its extensive glossary. The day is rapidly passing by when an advanced workman can subsist without literature. In the production of such works as this, the publishers are doing an excellent service to the mechanical world.

A MANUAL OF BACTERIOLOGY. By George M. Sternberg, M.D. New York: William Wood & Co. 1892. Pp. xii, 886.

It is perfectly obvious that Dr. Sternberg's immense work, one destined to take a fixed position as a classic in the science, cannot be adequately reviewed here. It is a large octavo with nearly 750 pages of text, 268 engravings, in addition to heliotype and chromolithographic plates. It contains a bibliography of 108 pages and a reasonably full index. This much tells of the make-up of the book. Dr. Sternberg's world-wide reputation must be relied on to tell the rest. Any one examining it must be irresistibly attracted toward its subject and feel like following in the steps so ably and fully indicated by the author; for the work does not merely describe micro-organisms, but gives the different methods of culture and of identification, treats of photography of bacteria, of all the methods and appliances used in their culture, and of experiments on animals. In the earlier sections it gives numerous illustrations to illustrate the apparatus and the use made of it.

TIME AND TIDE. A romance of the moon. By Sir Robert S. Ball. Second edition. London: Society for Promoting Christian Knowledge. New York: E. & J. B. Young & Co. 1892. Pp. 192. Price $1.

We have before now reviewed some most attractive little works coming in this "Romance of Science" series. Sir Robert Ball is known among the most interesting expositors of astronomy in the popular sense that we have, and these two lectures, for of such the book is composed, are to be confidently recommended to our readers. As a matter of interest we note on the frontispiece is a view of the moon from one of Mr. Rutherfurd's beautiful photographs, which tribute to the work of our American amateur photographer must be duly appreciated.

SCIENTIFIC AMERICAN BUILDING EDITION.

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1. Elegant plate in colors, showing a very attractive dwelling at Bridgeport, Conn., erected at a cost of $15,000 complete. Floor plans and perspective elevations. Joseph W. Northrup, architect, same place.
2. Plate in colors showing a residence at Armory Hill, Springfield, Mass. Two perspective views and floor plans. Mr. Francis R. Allen, architect, Boston, Mass. An excellent design.
3. A cottage at Brookline Hills, Mass., erected at a cost of $4,825 complete. Perspective views and floor plans. Messrs. Sheply, Rutan & Coolidge, architects, Boston. A picturesque design.
4. A dwelling erected at Holyoke, Mass., at a cost of $6,500. Floor plans, perspective, etc. Mr. G. P. B. Alderman, architect, same place.
5. A very attractive and convenient stable and carriage house erected at Plainfield, N. J., at a cost of $1,500 complete. Messrs. Rossiter & Wright, New York, architects.
6. A residence recently erected at Plainfield, N. J., at a cost of $9,175 complete. A picturesque design. Two perspective elevations and floor plans. Messrs. Rossiter & Wright, architects, New York.
7. An elegant residence recently erected at Malden, Mass., for Mr. B. G. Underwood. Two perspective views and floor plans, together with a view of the Holland stairway. Cost complete about $11,000. Mr. Frank L. Smith, architect, Boston.
8. A substantial residence at Holyoke, Mass. Perspective elevation and floor plans. Mr. H. H. Gridley, architect, Springfield, Mass. An excellent design.
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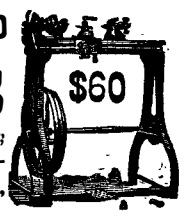

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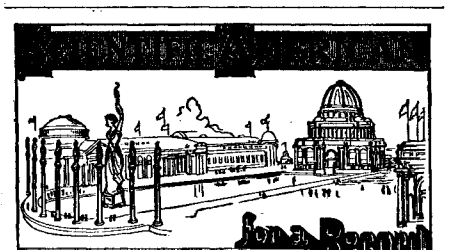

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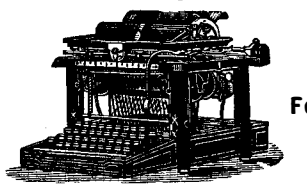

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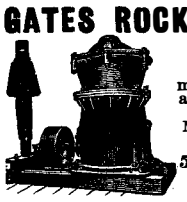

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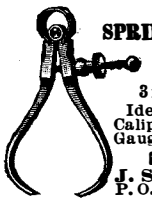

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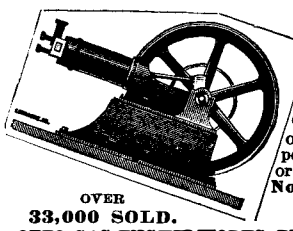

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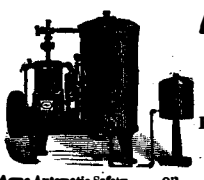

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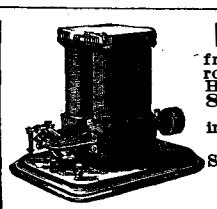

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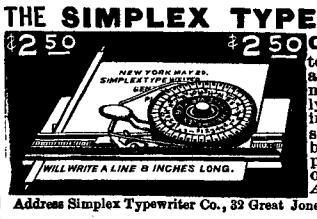

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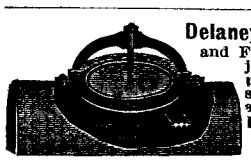

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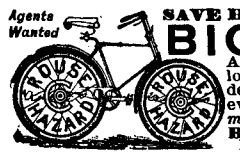

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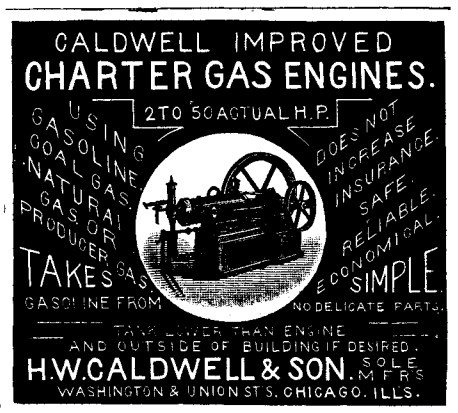

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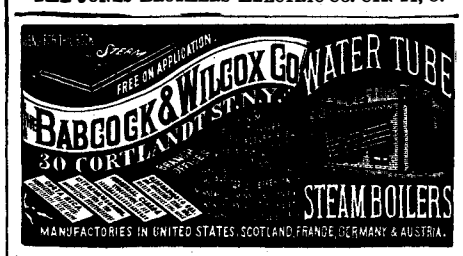
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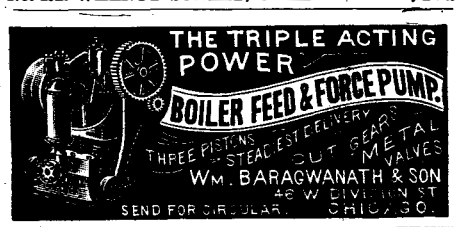

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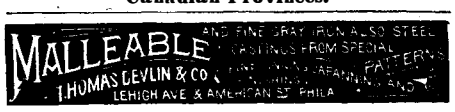

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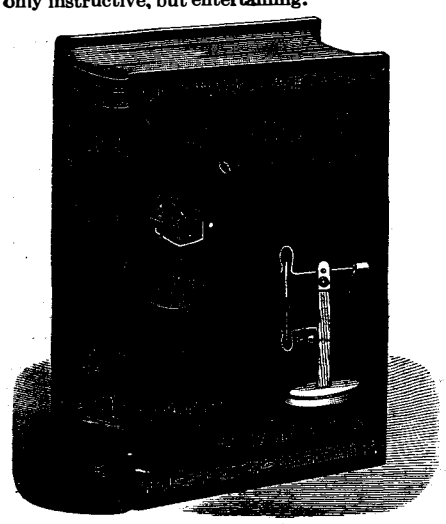

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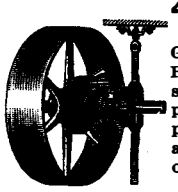

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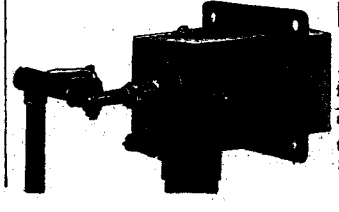

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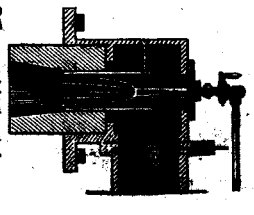

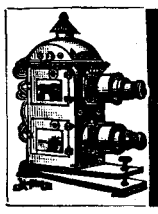

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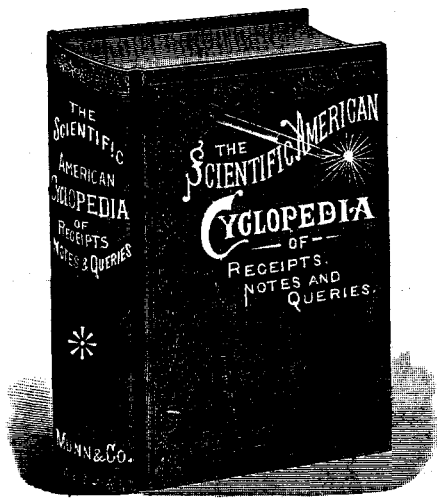

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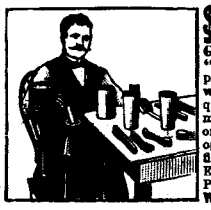

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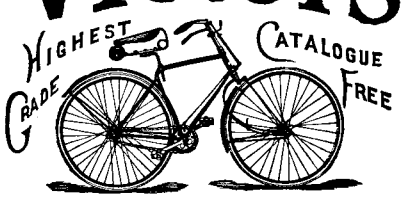

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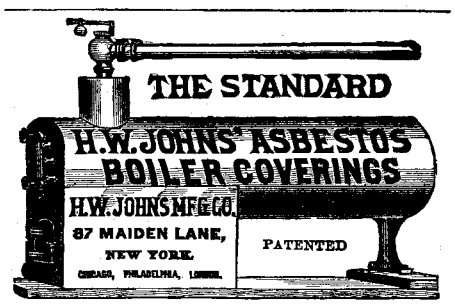

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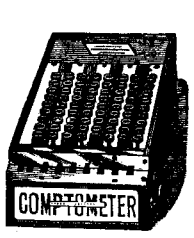

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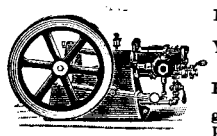

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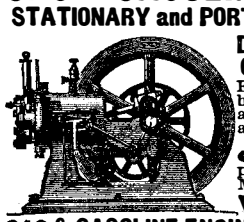

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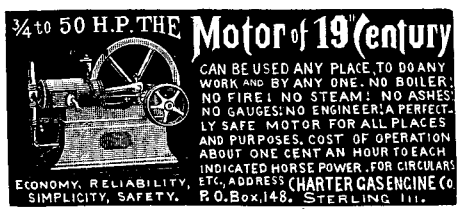
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